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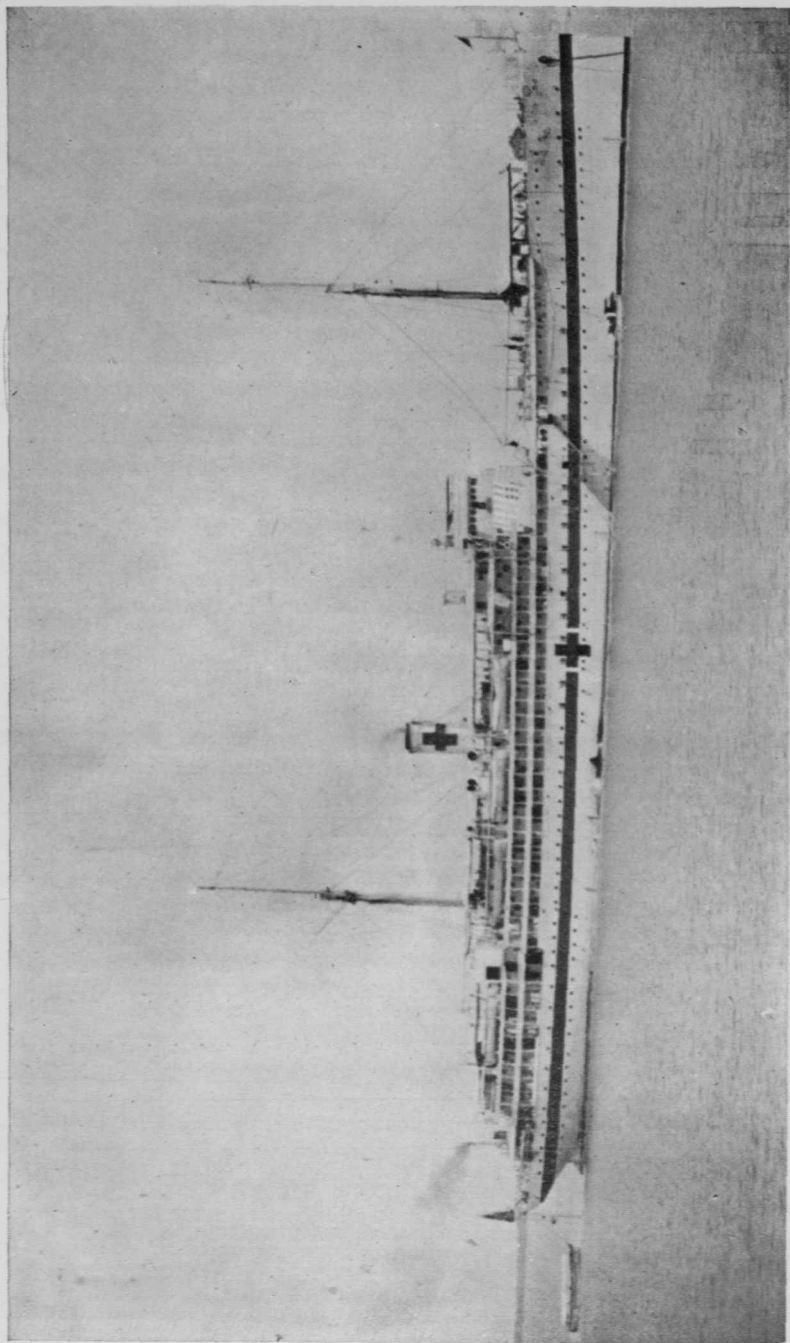
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U. S. S. RELIEF

Hospital Ship.—Launched at Philadelphia, Pa., in December 1919; Displacement, 9800 tons; Length overall, 460 feet; Beam, 61 feet; Horsepower, 5250; Speed, 116
Complement, 379.

THE COAST ARTILLERY JOURNAL

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The Beginnings of Coast Fortifications

By EDGAR B. WESLEY

THE general policy of unpreparedness which prevailed throughout the first decades of the United States is well exemplified in the tardy and feeble growth of coast fortifications. Fortunately the Revolution terminated successfully for the colonists, but they failed to learn the lesson of national defense. The army was disbanded, and the happiest delusions of reliance upon the militia took the place of preparations. The scanty navy completely disappeared, and was replaced by a blissful trust in isolation. The remains of Revolutionary fortifications crumbled into ruins, and the colonists solaced themselves with the notion of their ineffectiveness.

The series of international crises produced sporadic bursts of enthusiasm for preparedness but did not result in the establishment of any sustained policy of national defense. The army grew tremendously on paper, but in actuality it increased very slowly. A navy was proposed and voted whenever danger seemed imminent, but in reality few ships were constructed. The same lack of a consistent policy prevailed in the matter of coast fortifications, but some were erected, and their beginnings are worthy of study.

During the Critical Period no attempt was made to fortify the coast, and the first years of Washington's administration were equally barren of results. In his Third Annual Address on October 25, 1791, Washington urged Congress to consider "the fortification of such places as are peculiarly important and vulnerable,"¹ but this recommendation, like many other valuable suggestions of our first president, fell upon an unresponsive group of politicians, immoderately jealous of their supposed right and liberties. Nothing was done until 1794. On February 28 of that year a House committee recommended the following fortifications, garrisons, and cannon:

¹Richardson, *Messages and Papers of the Presidents*, I, 107.

<i>Place</i>	<i>Garrison</i>	<i>Cannon</i>
Portland	23	21
Portsmouth	23	15
Cape Ann	23	8
Salem	23	8
Marblehead	23	8
Governor's Island (Boston)	23	36
Castle Island (Boston)	32	12
Newport	31	24
New London	23	{ 24
Groton, Conn.	23	
New York	98	82
Mud Island, Penn.	98	48
Baltimore	31	28
Norfolk	31	24
Wilmington, N. Car.	22	12
Ocracoke, N. Car.	42	8
Charleston	98	72
Savannah	31	24

The remnants of Revolutionary fortifications remained at Castle Island, Goat Island (Newport), and Mud Island, and the committee recommended that they be repaired. The fortifications were to be constructed so as to protect the ports against a naval attack. Wherever feasible the parapets were to be formed of earth. The states were expected to furnish one hundred and fifty cannon, and the others were to be manufactured or taken from the public arsenals. The garrisons together with two inspecting majors were to number about seven hundred. The committee estimated the cost of construction at \$76,053.25, the cannon at \$96,645.00, and the pay and maintenance of the garrisons at \$90,349.25 annually.²

Congress debated the bill on March 5. Thomas Fitzsimons, of Delaware, declared that the measure was largely recommendatory, and that the execution must be left largely to the president. Some changes were made in the bill, Alexandria, Wilmington, Delaware, Georgetown, South Carolina, and St. Marys, Georgia, being added to the list recommended by the committee.³ The bill, carrying an appropriation of \$76,000, providing for three hundred and fifty cannon of varying calibers, and authorizing the use of troops as garrisons, became a law on March 20. It also authorized the president to receive cessions of the sites from the states or to purchase sites in case they were not ceded.⁴ Due to a petition of the citizens of Annapolis, and to a vigorous campaign carried on by William Vans Murray, of Maryland, that city was added to the list of places to be fortified, May 9.⁵ On June 9 an additional appropriation of \$30,000 for coast defense was made.⁶

²*American State Papers, Military Affairs*, I. 61-65. Hereafter cited as *A. S. P., M. A.*

³*Annals of Con.*, 3 Cong., 1 Sess., 469. 479-480.

⁴*U. S., Statutes at Large*, I. 345.

⁵*Annals of Cong.*, 1 Sess., 563. 615-616; *U. S., Statutes at Large*, I. 267.

⁶*U. S., Statutes at Large*, I. 394.

The erection of the coast fortifications involved several constitutional questions. Since the states were expected to furnish part of the cannon, the forts cannot be regarded as entirely national. A more important question was that of the ownership and jurisdiction of the sites. This problem was unsolved for many years and troubled succeeding presidents.⁷ The first state to authorize the national government to occupy the necessary sites was Maryland whose House of Delegates passed such a bill on December 25, 1793, applying, however, to only one site in this particular bill.⁸ Rhode Island followed on May 12, 1794,⁹ and North Carolina on July 7. North Carolina ceded the jurisdiction of the sites to the United States with the reservation that state officers should have the right to serve processes and levy executions within the ceded district. It further stipulated that the proposed sites should be occupied within three years, and that they should be maintained "forever."¹⁰ In 1795, Pennsylvania ceded Mud Island in the Delaware and certain sites at Presque Isle on Lake Erie; and a few acres were purchased by the government at Baltimore.¹¹ However, most of the states failed to grant the federal government jurisdiction over the sites, and some hesitated to allow even the construction of the fortifications on land which was bought. In Massachusetts the directing engineer treated with the local town meetings in order to secure the desired places.

Henry Knox, Secretary of War, selected the engineers to direct the erection of the fortifications. Among them were Stephen Rochefontaine, later a lieutenant colonel of the army,¹² Col. Charles Vincent, John Vermonnet, M. Martinon, Paul Hyacinte Perrault, later a lieutenant colonel, Peter Charles L'Enfant, and John Jacob Ulrich Rivardi, later a major.¹³ The engineers were instructed to proceed to their respective assignments and visit or communicate with the governor of the state and secure his approval of the proposed fortifications. They were urged to prosecute the work with all possible vigor and economy. The engineers were not concerned with the gathering of materials or the employment of labor, but were to consider the location, plan, and nature of the work, subject always to the approval of the governors.

⁷The national government settled the matter of jurisdiction by the law of March 2, 1795, which specified that all cessions of land for lighthouses, beacons, buoys, and public piers should be received with the understanding that the state had civil rights within such cessions. U. S., *Statutes at Large*, I, 426.

⁸*A. S. P., M. A.*, I, 71.

⁹Richardson, *op cit.*, I, 154.

¹⁰*A. S. P., M. A.*, I, 115.

¹¹*Ibid.*, I, 71.

¹²Rochefontaine was a major in the Revolutionary Army. Knox to Lafayette, in Drake, *Life of Knox*, 133. He was appointed a lieutenant colonel on Feb. 26, 1795, and was dismissed May 7, 1798. Heitman, *Register of United States Army*, I, 849.

¹³Heitman, *op. cit.*, 833. Rivardi was appointed a major on Feb. 26, 1795, and was honorably discharged June 1, 1802.

This compliant attitude was necessary since the actual construction was largely under the direction of the officials appointed by the governors.

During the summer and fall of 1794 the work progressed rapidly. Rochefontaine, the engineer in charge of the works at New London and northward, secured the consent of the governors of Connecticut, Rhode Island, and New Hampshire, but the governor of Massachusetts was somewhat in doubt as to his right to grant permission for the erection of the works, and the legislature was interested in Castle Island only. As a result of these difficulties the federal government temporarily abandoned its plans at Boston.¹⁴ Rochefontaine proceeded to Portland and secured a site consisting of four acres which a town meeting authorized the selectmen to purchase for \$68. A similar course was pursued at Gloucester, Salem, and Marblehead, the last mentioned town ceding some public land to which was added a lot purchased for \$310.

The fortifications consisted in general of parapets, magazines, blockhouses or barracks, and redoubts. All were designed to afford protection against sea attacks only, except the defenses of Newport which were to be so erected as to afford protection against land attacks as well as those by sea.¹⁵

The fortifications of New England were prosecuted with energy during 1794, and those at New York and West Point were well under way by autumn. L'Enfant, the engineer who was to superintend the erection of the works on the Delaware, became involved in a dispute with the governor of Delaware as to the location of the fortification at Wilmington, and the plan was abandoned.¹⁶ The work at Mud Island made satisfactory progress. Rivardi, the engineer for Baltimore and Norfolk, spent the early part of April at the former place, laying out the plans, and reached Norfolk early in May. The sandy soil made the erection of the parapet at the latter place difficult and expensive, but Governor Lee enthusiastically assisted, and a great deal of labor was donated by the citizens. However, dissatisfaction soon arose because the fortifications were too removed from Portsmouth and Norfolk to afford the protection which the citizens expected, and some opposed all such defenses, but Rivardi was able to report on December 9 that the works were almost completed. Samuel Dodge, the director of the works at Baltimore under the supervision of Rivardi, also reported a fair degree of progress. Vermonnet, the engineer in charge at Alexander and Annapolis, reported that the works at the latter place

¹⁴*Annals of Cong.*, 3 Cong., 2 Sess., 1129.

¹⁵*A. S. P., M. A.*, I, 72-77.

¹⁶*Annals of Cong.*, 3 Cong., 2 Sess., 1129; *A. S. P., M. A.*, I, 84-87.

were far advanced, but that those at Alexandria would not be finished until the following year. Martinon, the engineer in charge at Wilmington and Ocracoke, reported that the greater part of the works was finished, but that a great addition would have to be made to the estimated cost. Perrault, the engineer at Georgetown, Charleston, Savannah, and St. Marys, had great difficulty in constructing the parapets since the soil was too sandy to prove serviceable. South Carolina had already begun some fortifications at Charleston, and the citizens raised a subscription and donated much labor, the government being under the obligation of feeding the negroes who did the work. The forts at Charleston were well advanced by the end of the season, but those at St. Marys had not been started.¹⁷

Scarcely any of the fortifications had been entirely completed, and the two appropriations had been exhausted. Nothing had been done at Boston, and in spite of Vincent's hopeful report, little more than plans had been made at New York. A general plan for coast defense had been formulated, but its completion was far in the future.

In December, 1794, Congress gave the subject of coast fortifications renewed attention, and a committee of the House recommended on December 4 that \$500,000 be appropriated for the purpose of completing the works with the most durable materials, and that \$100,000 be provided annually for their maintenance.¹⁸ The report was debated on January 23, 1795, and considerable opposition developed, some members opposing permanent fortifications, and others opposing the fortifying of so many places. The ruinous condition of Fort William on Castle Island was mentioned by Fisher Ames of Massachusetts,¹⁹ and another speaker objected to fortifying such places as Alexandria and Annapolis.²⁰ The matter was referred to the committee which reported on January 28 in favor of an appropriation of \$50,000 for completing the fortifications.²¹ This recommendation was accepted, and the bill became a law on March 3, 1795.²²

A report of the Secretary of War, Timothy Pickering, on January 16, 1796, showed that some of the fortifications had been entirely completed, but they were of no very impressive proportions. Those at Boston were still under the control of Massachusetts, and those at Wilmington, Delaware, Annapolis, and Alexandria had been abandoned. The projected fort on Beacon Island, Ocracoke, had also been

¹⁷*A. S. P., M. A.*, I, 71-105.

¹⁸*A. S. P., M. A.*, I, 68. The critical condition of our foreign affairs accounts for this unusual and enthusiastic report.

¹⁹Ames was evidently ignoring the fact that Castle Island was not a federal fort. He declared that it was much safer to stand without than within such fortifications.

²⁰*Annals of Cong.*, 3 Cong., 2 Sess., 957, 1129-1131.

²¹*A. S. P., M. A.*, I, 107-108; *Annals of Cong.*, 3 Cong., 2 Sess., 1147.

²²*U. S. Statutes at Large*, I, 430.

given up since it was too much exposed to the sea and ninety miles from any inhabitants. The one at Georgetown was likewise relinquished on account of a disagreement with the owner as to its value and on account of the unhealthfulness of the location. Many of the fortifications were not garrisoned and so naturally suffered from neglect.²³

On May 9, 1796, a committee of the House reported on fortifications. It declared that no further plans were necessary but advised an appropriation in order to maintain the ones already constructed. The fortifications at New York had been laid out on a bigger scale than Congress contemplated, and the state had spent considerable sums, but they were yet incomplete, and the committee recommended special attention to that port.²⁴

The debates which took place in the House on May 13 on the bill to supply funds for the completion of the works at New York reveal the motives and opinions of those who controlled the national defense policies. William Lyman, of Massachusetts, John Williams, Ezekiel Gilbert, and Edward Livingston, of New York, and John Swanwick, of Pennsylvania, spoke in favor of the appropriation, and William Smith, of South Carolina, Samuel Smith, of Maryland, and Jonathan Dayton, of New Jersey, spoke against it. Lyman said that the fortifications were mostly completed except those at New York, and that the committee asked for a special appropriation for that worthy object. Williams said that New York state had spent \$200,000 of its own money for fortifying the city, and that the national government was now properly approached for the sum of \$101,968 for completing and preserving the works. Gilbert said that the desired appropriation should be granted in order to preserve what had been done. Livingston felt that Congress should legislate for the whole United States, and that he regarded himself as a representative of the nation as well as of New York. He felt that the preservation of that city was of national concern. Since the state itself had done so much the nation was under obligations to complete and preserve the forts. He explained New York's failure to cede the sites to the national government by saying that the state had paid for the works and were waiting for some proof that the country would care for them before making such cession. He said that the Revolution had been prolonged by the British occupation of New York, and that its proper defense was of national impor-

²³A. S. P., M. A., I, 110-111, 112, 115, 116. Pickering's idea of coast garrisons is humorously illustrated in his report of Feb. 3, 1796: "To garrison the most important fortifications on the sea coast. The smaller ones in time of peace may be taken care of, each by an individual, such as an invalid, or other poor citizen, at a very small expense."

²⁴*Ibid.*, I, 115.

tance. Swanwick said he also favored a broad national view, but that he feared that feelings of locality were dominant. He emphasized the necessity of coast fortifications since the nation had no navy.

On the other hand W. Smith doubted whether the time was opportune, but if it was, then he felt that Charleston should be added to the list of benefitted ports. He thought that New York, being a wealthy state, could well afford to care for its own fortifications. S. Smith supposed that all the states would want a share, and that he was in favor of New York applying \$100,000 of its debt due the nation to the purpose of fortifying its ports. Dayton doubted whether fortifications on Governor's, Ellis', and Bedloe's Islands could protect New York. He pictured a fleet rushing past the forts and into the harbor unharmed. He thought that Long Island, Staten Island, and the Narrows were the proper locations for the forts. He objected to the expenditure of national money at New York because that state had not ceded its sites to the government. The resolution to assist New York was defeated by voting to discharge the committee, the vote standing sixty-four to fourteen,²⁵ and as a result of the fight over a particular port no appropriations for any fortifications were made during the year.

On June 3, 1797, James McHenry, Secretary of War, asked for an appropriation of \$200,000 for fortifications and urged that suitable garrisons be provided for the forts.²⁶ On June 23 Congress appropriated \$115,000 and provided that states which were indebted to the nation could discharge their obligations by erecting fortifications under federal supervision.²⁷ This appropriation with an unexpended balance of \$22,065.58 afforded the sum of \$137,065.58 for fortifications, but McHenry used less than \$40,000. Only Mud Island which received about \$24,000, Charleston which received about \$10,000, and St. Marys which received about \$4,000 were attended to, and on February 27, 1798, he reported an unexpended balance of \$97,683.93. McHenry's explanation for inactivity was the uselessness of fortifications when no garrisons were provided. He declared that no part of the regular forces could be spared from the frontiers. Another excuse was the unwillingness of the states to cede the sites, or to discharge their national debt by erecting fortifications.²⁸

Naturally McHenry's policy aroused the ire of Congress, and a committee report of March 8 complained that so little had been done. It pointed out that more effective work and greater economy would result from placing the work under the supervision of some one who

²⁵*Annals of Con.*, 4 Con., 1 Sess., 1360-1373.

²⁶*A. S. P., M. A.*, I, 118.

²⁷*U. S., Statutes at Large*, I, 521-522.

²⁸*A. S. P., M. A.*, I, 119-120.

could give it immediate supervision, and declared that the War Department "as at present established" was unsuited for the carrying out of the purpose.²⁹

Not only was Congress dissatisfied with McHenry's policy of neglect, but also some of the cities, particularly New York whose Chamber of Commerce presented a petition for the completion of the neglected works at that place. The petition deplored the defenseless condition and declared that it constituted a national menace.³⁰ Evidently these objections and criticisms had their effect, for on April 9 McHenry estimated that \$1,000,000 would be required to complete the fortifications, though he thought the creation of a navy might save some of that amount.³¹ The committee, too, profited from McHenry's recommendations and urged an increase in the artillery and engineers in order to garrison the fortifications. It proposed the expenditure of \$50,000 at Boston which had hitherto been almost entirely neglected, \$50,000 at New York which had received only about \$13,000, and \$30,000 for establishing new fortifications at Old Point Comfort and Fort Nelson. Other sums were proposed for further work at Newport, Baltimore, Charleston, Savannah, and St. Marys.³²

The debates of April 9 and 11 show that the policy of coast fortifications was by no means firmly established. Nathaniel Macon, of North Carolina, declared that the fortifications were mostly useless because they were improperly located, and that they were of no certain benefit even if well located. He said that Europe was abandoning fortifications. He feared the revenues would not support such a plan as had been undertaken, and was particularly opposed to New York's receiving any large sum. Samuel Smith, of Maryland, criticised McHenry for not proceeding with the works as Congress had provided. He thought that his reasons for not doing so were unsatisfactory since it was not his place to be the judge of a matter that Congress had decided. Jonathan Dayton, of New Jersey, opposed appropriations until the states ceded the sites. Joseph McDowell and William Barry Grove, of North Carolina, expressed disappointment that no progress had been made in fortifying the coasts of their state. Thomas Pinckney, of South Carolina, a member of the committee, explained that it had not overlooked the North Carolina coast, but that it considered a

²⁹*Ibid.*, I, 119.

³⁰*Annals of Cong.*, 5 Cong., 2 Sess., 1312.

³¹*A. S. P., M. A.*, I, 120-121.

³²*Annals of Cong.*, 5 Cong., 2 Sess., 1333.

patrol more effective, and that fortifications were useless except as a protection for large cities. Many speakers took part in a general wrangle over the question of inserting specific places to be fortified and the amounts to be spent. Some felt that the President should have charge of the matter and thus eliminate local prejudices, while others declared that specific enactments were necessary in order to get anything accomplished. Albert Gallatin, of Pennsylvania, was in favor of inserting specific places since general appropriations had not been spent. He thought that a part of the appropriation might properly be left as a general fund to be administered at the discretion of the President. He censured New York for not ceding its sites and for not paying its debt to the nation, but he thought that conditions demanded immediate action, and he favored an appropriation.³³

On May 3, Congress appropriated \$250,000 without specifying places or amounts for any particular ports. The law provided that states which wished to discharge their debts to the nation by erecting fortifications must cede the proposed sites to the United States.³⁴ No appropriations for coast defense was made in 1799, but on March 3 of that year Congress provided for an inspector of fortifications.³⁵ The appropriation for the year 1800 was \$100,000, made on May 13 in accordance with McHenry's recommendation of May 1.³⁶

Within the first decade of the republic twenty-one ports were fortified with one or more works, and more than a half million dollars were expended. The government slowly learned that constant attention and repeated appropriations were necessary to insure adequate defense. This course was greatly aided by the frequent crises which threatened war, and it had become a fairly well-established policy.

This completes the survey of the first period of coast defense, for no appropriations after the one of 1800 were made until 1806, and so naturally the fortifications fell into neglect. Thus the beginning of Jefferson's administration marks a change of policy or, perhaps more properly, the cessation of a policy. In his First Annual Message of December 1, 1801, he declared that coast fortifications cost too much and required too many men to maintain.³⁷ As a result of this attitude no extensions were made for six years, and repairs were kept within

³³*Annals of Cong.*, 5 Cong., 2 Sess., 1380-1383, 1394-1402.

³⁴U. S., *Statutes at Large*, I, 554-555.

³⁵*Ibid.*, I, 749-755, Sec. 18.

³⁶A. S. P., M. A., I, 151; U. S., *Statutes at Large*, II, 83-84.

³⁷Richardson, *op cit.*, I, 329-330.

small amounts. Jefferson's policy of unpreparedness is well known and often remarked. What is less well known is his gradual and almost complete change of attitude. The annual messages show a constant upward curve in their emphasis on preparedness. This trend is true to some extent of his first administration and becomes inescapably evident in his second term. The appropriation for coast defense in 1806 was followed by a larger one in 1807, and in 1808 the sum of \$1,000,000, an amount four times as large as any previous appropriation, was voted on January 8.³⁸ These acts were doubtless caused by the war crisis with England which persisted until 1812 and so properly belong with the study of that period.

³⁸U. S., *Statutes at Large*, II, 402, 443, 453.

APHORISME XLIII

The furious Coursour breaketh his wind in the midst of his career, whereas the Snail comes to the top of the hill in her due time as well as the Eagle; Wherefore hee that will doe a thing well must have patience to tarrie till it may bee well done: for it hurteth as much to anticipate the occasion as to foreslow it being offered. Men of hot spirits erre in the first, for scarce doe they perceive the shadow of her, but they run to catch at it, and thinking to take hold on the sollid substance, imbrace nothing but the empty aire; whereas the wary and well advised Commander, holds it safer to weary and weare out the enemy by cunctation and delay, than to put all to hazard by hast; in this is danger, in that is a Fabian vertue.—Ward's Animadversions of War (London, 1639).

Adjustment of Antiaircraft Artillery Fire

By CAPTAIN GORDON B. WELCH, C. A. C.

IN firing any artillery, it is the intention of the artilleryman to place the center of impact of his shots in a certain relation to his target, usually to place the center of impact on the center of the target. Due to many causes some of which pertain to the personnel and materiel of the battery and some to the atmosphere through which the projectiles travel, this idea is seldom realized in the first group of shots fired at any time upon a given target. Based upon his observation of the actual fall of the shots, his knowledge of the laws of ballistics, and of the probabilities governing the fall of shots, the artilleryman endeavors to shift the center of impact from its actual position to the desired position. The whole operation of observing the fall of shots and shifting the center of impact is called the adjustment of fire.

Much doubt exists in the minds of most officers at the present time with regard to the possibility of the adjustment of fire at any single aerial target. It is believed by many, perhaps most, officers connected with antiaircraft artillery that with the first bursts appearing around a hostile airplane close enough to be susceptible of adjustment, this airplane will at once depart radically from the conditions of rectilinear flight at constant altitude and speed which make accurate predictions possible. The case will probably never be entirely settled until hostile aircraft are actually fired upon. In the meantime, however, methods of adjustment should be studied, because adjustment of some sort will certainly be desirable if possible.

In making an adjustment of fire at a fixed target on the land or water, the principal difficulties encountered are those pertaining to the observation of the fall of the shots. When the target is moving on land or water, the problem is further complicated by the changing range, ballistic conditions, and the unknown factor of what the target will do during the time of flight. When a target is moving in the air and, as is the case with all airplane targets, at a high rate of speed, the problem is still further complicated not only by the same conditions which complicate the moving land or water target but also by the fact that observation of the fall of shots must be made by locating bursts in three dimensions in relation to a rapidly moving target which must itself be located in three dimensions. The unknown factor of

what the target will do during the time of flight has a much greater influence upon the aerial problem than on the land. The target can deviate rapidly from his course in any direction so that predictions and the bursts based on them may deviate from the target due to this cause alone by large amounts and in any direction.

Assuming, however, that adjustment of antiaircraft artillery fire during the firing is or may be possible, the most careful preparation of fire by all available means should not be neglected on this account. It might be argued that if fire will always have to be adjusted before it is satisfactory, adjustment should as well be left to take care of all deviations of the center of impact, those resulting from known causes as well as those from unknown. Such is, however, not the case. Surprise effect is especially vital in antiaircraft fire in order that the target may be destroyed if possible before he has had time to deviate from the conditions of successful prediction. To accomplish this, it is necessary that the first bursts fired shall be as accurate as it is possible to make them. Constant study of the battery materiel, thorough training of the personnel, combined with a study of the prevailing ballistic conditions will do much to reduce the number of unknown conditions tending to cause deviations. Adjustment of fire should be utilized to correct only such deviations as are due to the unknown causes. All causes of deviations which are known should be eliminated.

An examination of some of the more important causes of deviations will show many which can be remedied, some which can be remedied with one system of data determination but not with others, and some which cannot be remedied or corrected for prior to the firing. Some of these causes are as follows:

- (1) *Incorrect determination of altitude.*
- (2) *Instruments not properly adjusted.*
- (3) *Gun not properly adjusted.*
- (4) *Reading data computers incorrectly.*
- (5) *Data computers do not compute correct data.*
- (6) *Incorrect transmission or reception of data.*
- (7) *Incorrect setting of data.*
- (8) *Incorrect computation or applicaion of the trial shot problem.*
- (9) *The projectile does not follow the prescribed trajectory.*
- (10) *The fuse does not burn at the expected rate.*
- (11) *The ballistic wind is not correctly determined or employed.*
- (12) *The ballistic density is not correctly determined or employed.*
- (13) *Muzzle velocity is not correctly determined or employed.*
- (14) *The target changes its course, speed, or altitude.*

With the instruments in use at the present time, incorrect determination of altitude is a very frequent source of error in the firing data. This, in most cases, cannot be entirely remedied as the usual errors do not ordinarily appear to be either constant or regular in value or in sign. With regard to changes in the course, speed, or altitude of the target, care should be taken, with any system of adjustment, that observed deviations have not been caused by such a change, as in this case arbitrary adjustment corrections would of course be worse than useless.

Ballistic conditions in the upper atmosphere are difficult to determine accurately and are no doubt a frequent source of error. Muzzle velocity changes are also difficult to determine. Moreover, most data computers in use have no provisions whereby changes in muzzle velocity and density can be corrected for. Attempts to care for these changes by corrections based on trial shot firings have been only partly successful and further experiments are being conducted with a view to improved methods of computation. Experience therefore continues to show that deviations are to be expected ever after the most careful preparation of fire.

Three kinds of deviations can be considered as seen from the battery. These are:

(1) Deviations in *Altitude*. With incorrect altitude set into the data computers, the bursts may be far over or far short of the target but from the battery they appear to be exactly on the line of position. That is, they appear to be bursting right on the target.

(2) Deviations in *Vertical Deflection*. These deviations will usually be comparatively small. If they appear alone, the bursts will seem to be correct laterally but above or below the target.

(3) Deviations in *Lateral Deflection*. Sometimes these deviations are large. Bursts appear either ahead of or behind the target. Any combination of two or all of the above may appear together. Thus bursts may appear above and ahead of the target and at the same time be far above it in altitude. A special kind of deviation is caused by erratic burning of the time fuzes. It cannot, however, be distinguished with certainty by observation at the battery. Suppose for example that the altitude of a target had been accurately determined and that both vertical and lateral deflections had been correctly computed for passing the trajectory through the target. The fuze, however, although correctly set, burned much too long. The trajectory passed through the target but the projectile did not burst until the target had moved on and the projectile continued its flight some distance beyond it. The burst therefore appeared to be below and behind the target although the data was correctly computed. Figure 1 shows these bursts as they

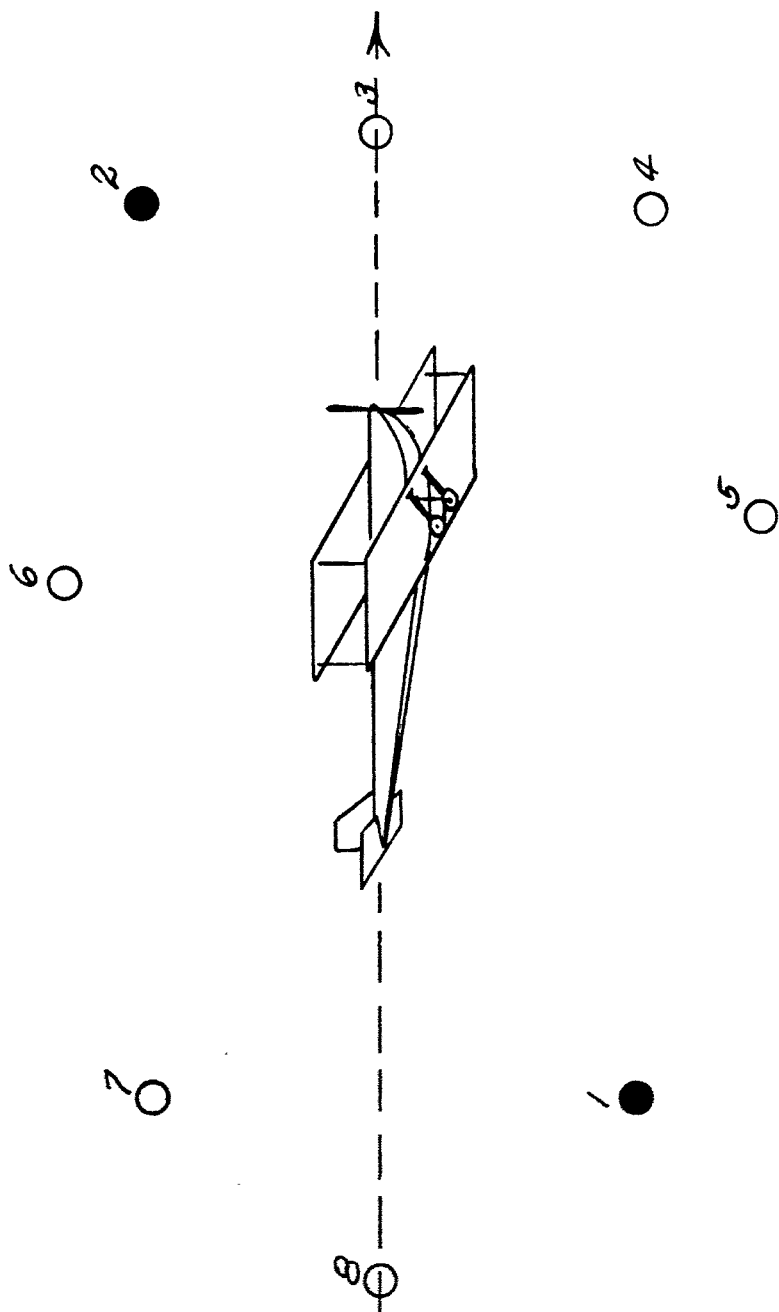


FIG. 1

appear from the battery and other possible deviations due to various causes. In this figure, burst 1 could have been caused by a fuze which burned too long while burst 2 could have been caused by a fuze which burned too short. They could have been caused, however, as far as their appearance from the battery is concerned by incorrectly computed vertical and lateral deflections.

It will sometimes happen that successive bursts in any string do not appear in any constant relation to the target. That is, the first may be ahead, the second behind, the third high and behind, the fourth high and ahead, and so on. Some erratic causes of error are at work to cause such a distribution and no corrections to the firing data can be made which will be of any value until the deviations become constant in some one direction. The first principles of the adjustment of aerial fire can now be stated in general terms:

- (1) Eliminate all known sources of error.
- (2) If deviations are not constant in direction, eliminate the causes of erratic distribution or nothing can be done.
- (3) If constant deviations are appearing and all known sources of error have been eliminated, make an appropriate adjustment.
- (4) In making the adjustment, make full correction for observed or estimated deviations, as the number of shots observed in a given sense will be sufficient to warrant such a correction.

A simple method of adjustment will now be discussed, the rules of which are easy to apply and which has been successfully used. Other successful methods will no doubt be developed. The simplicity of this one however, and the ease with which corrections can be applied during the firing commend it above other and more complicated methods. Two steps are required to complete an adjustment by this method, repeated as many times as may be necessary to place the center of impact on the target.

(1) (a) Observe the bursts from the battery CP and measure or estimate the lateral and vertical deviations.

(b) Apply arbitrary vertical and lateral deflection corrections sufficient to bring the bursts apparently on the target as seen from the battery.

(2) (a) Observe the range deviations along the line of position either by means of a stereoscopic height finder or by means of flank observers.

(b) Apply altitude corrections to the altitude being used by the data computer sufficient to bring the center of impact onto the target.

This method assumes that the deviations are constant in sign, fairly constant in amount, and that they are ordinarily due to unknown causes. For the latter reason, all corrections are made arbitrarily, no attempt being made to single out the causes of any observed deviation and

apply a correction to those causes. The first step in the adjustment brings the bursts on the line of position. So far as direct visual observation at the battery is concerned, they are then bursting right on the target. They may, however, be either over or short along this line of position. Stereoscopic or flank observation reports them either as over or short. If a minus correction is applied to the altitude. If short, a plus correction. This has the effect of moving the bursts up or down the line of position without changing the apparent deflections as seen from the battery.

The corrections applied as indicated in the preceding paragraph have caused changes in the center of impact which was presumably correctly computed by accurate information. Some part of these changes is no doubt due to the fact that the firing data was not correctly computed but the larger part is probably due to ballistic causes of unknown kind and intensity. It is probable therefore, that corrections which have resulted in placing the center of impact on the target will not keep it there as the target changes its range and angle of approach with reference to the battery position. This departure of the center of impact into new constant deviations should, however, be relatively slow and must be corrected for again by applying the adjustment rules when the deviations have become sufficiently great to warrant it. No method of computing and applying corrections which will remain appropriate as a moving target traverses the field of fire has yet been devised even for so old an art as seacoast artillery firing and much less so for the newer anti-aircraft artillery. The subject, however, deserves much further study and this study, it seems, should be directed along the lines of a correct determination of the causes of deviations together with the application of appropriate remedies.

Some attempt has been made to assign a specific cause, for the purpose of applying adjustment corrections, to deviations in vertical and lateral deflection. Suppose, for example, that the actual time of flight to the target is greater than that given by the firing tables. Since all data computers, except the Director T-1, use the firing table time of flight as a multiplier in computing deflections, the deflections computed by using a firing table time of flight which is less than the actual time of flight will be too small and deviations in vertical and lateral deflections will result. If an arbitrary plus correction be made to the time of flight which the data computer is using, the vertical and lateral deflections will be corrected and the bursts should appear on the target. It may often happen, however, that the observed deviations have not resulted from the use of an erroneous time of flight. One deflection may be too small while the other is too great. In such a

case the application of a time of flight correction would not be appropriate. No matter whether a plus or minus correction is applied, one deflection will be helped while the other will be enlarged. It seems best therefore, that in the absence of knowledge of the causes of deviations, arbitrary corrections should be applied which will certainly bring the bursts near the target temporarily at least. Still less would one be justified in making time of flight corrections when using a data computer such as the Director T-1 which, in computing the time of flight for its own use, has made use of all known ballistic conditions.

Some question will doubtless arise as to whether there will be time to complete an adjustment as described in the preceding paragraphs before the target has gone out of range or has departed from the conditions necessary for adjustment. The following is an estimate of the time necessary for an adjustment:

Conditions:

Four guns calibrated and in proper adjustment. Trial shots have been fired and all obtainable ballistic data secured and appropriately used. Instruments and sights oriented and adjusted. Stereoscopic range sensing is available. The target is a bomber at such a range and altitude that the time of flight is 15 seconds.

Time Estimate:

Time to first bursts	15 seconds
Time to observe lateral and vertical deviations and apply corrections	10 seconds
Time for these bursts to appear	15 seconds
Time to sense range deviations and apply altitude corrections	10 seconds
Time for adjusted bursts to appear	15 seconds
Total time	<u>65 seconds</u>
Deduct time of flight to first bursts as target had then no warning that he was being fired on	<u>15 seconds</u>
Total time after target is warned until adjustment is completed	50 seconds

Thus, if a target will maintain rectilinear flight at constant altitude and speed for approximately one minute after bursts begin to appear around him, successful adjustment can probably be completed. It has been stated by some that a bomber must necessarily maintain these conditions of flight for approximately one minute before dropping bombs upon an objective. By others this statement has been denied.

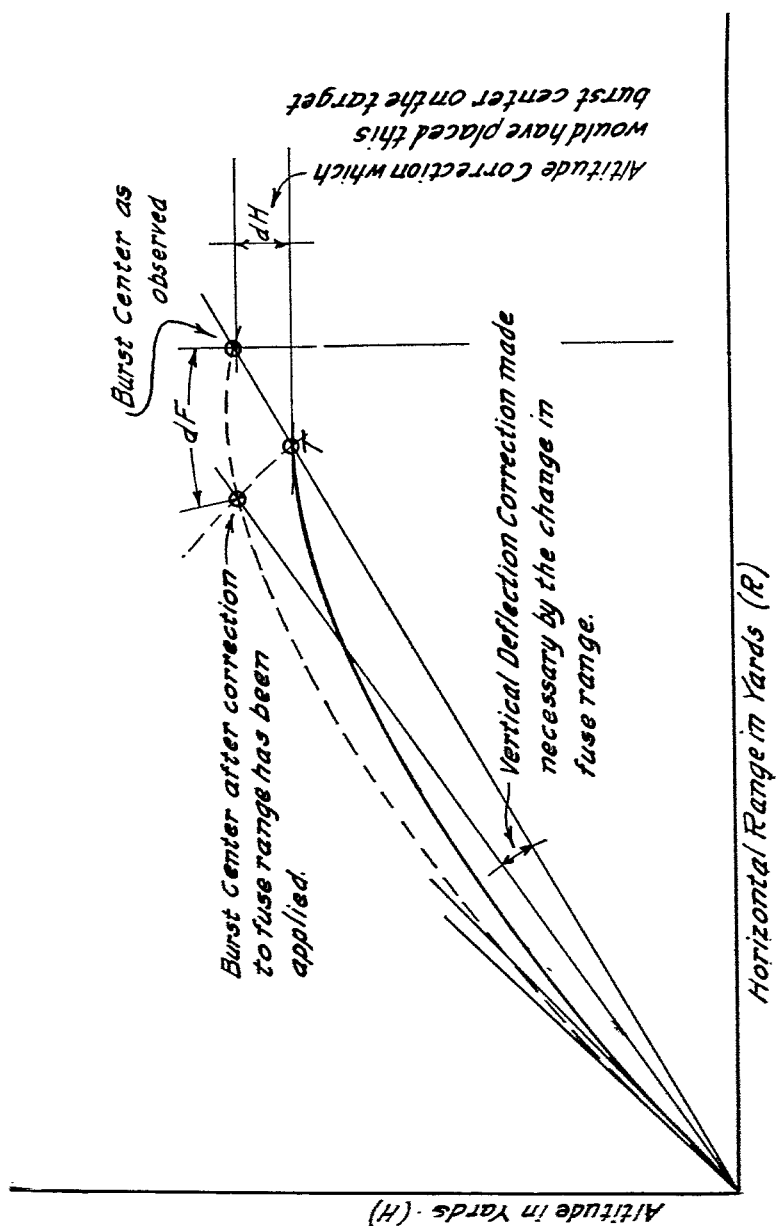


FIG. 2

Whether or not these conditions of flight will actually be maintained in any particular case necessarily depends on many circumstances such as the capabilities of the airplane, its mission, and the character of the pilot so that no prediction can be made in the particular case as to the possibility of adjustment. If the anti-aircraft fire is not effective however, in either destroying the hostile airplane or preventing the accomplishment of his mission, adjustment of fire should by all means be attempted.

In order to accomplish an adjustment in the time available, thorough organization of the means at hand must be perfected. Assume that a Computer, AA Data, M-1917 (RA Corrector), is in use with a self-contained height finder giving altitudes and range sensings. As the first bursts appear the battery commander measures or estimates their deviation in vertical and lateral deflection and signals the correction to be applied to the Range Officer or Sergeant in Charge of the data computer who applies them directly to the moveable scales on the speedometers. If the organization is thoroughly trained, the Range Officer or Sergeant in Charge may make these observations and apply the corrections directly without waiting for the Battery Commander. This effects a saving in time. The Battery Commander should, however, make the altitude changes himself since he must estimate the amount of such changes. The stereoscopic height finder gives him sensings only and not the amount of the deviations. These instruments usually have a scale for the application of ballistic altitude corrections. To send these corrections to the height finder and then have the corrected altitude return from the height finder to the data computer involves lost time which should not be wasted. Corrections should be applied directly to the data computer either by calling out a new altitude or by saying or signalling UP or DOWN so many yards. When using the Director, M-1, the application of deflection corrections is easier than with the Computer, AA Data, M-1917, but the application of altitude corrections is more difficult. Whatever system is in use, much coordination and drill will be necessary.

It is now necessary to consider the possibilities of adjustment of fire by means of changes in the fuze setting. Many attempts have been made by battery commanders of anti-aircraft artillery under target practice conditions to effect adjustment by this means. Usually however, the adjustment corrections have been applied between courses and not while the actual firing was going on. In fact, to apply a correction to the fuze setter while firing a rapid string is difficult if not impossible. But, assuming it to be practicable, Figures 2 and 3 show some of the results which will ensue. Figure 2 illustrates the case of a perfectly

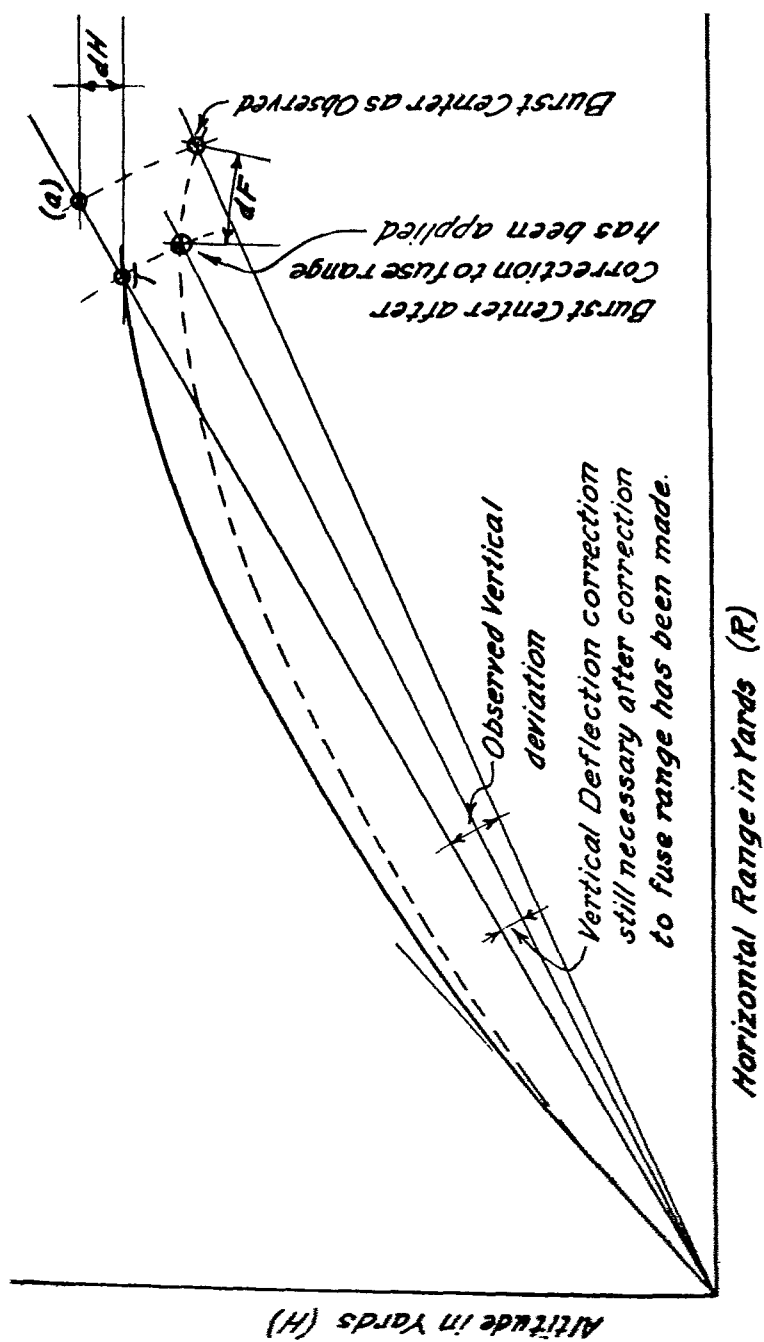


FIG. 3

adjusted battery using an altitude in the data computer greater than the actual altitude of the target. So far as can be seen from the battery, the bursts are falling on the target. The stereoscopic or flank observer however, reports all shots as OVER. The Battery Commander proceeds to shorten his fuze and bring the bursts down the trajectory thus increasing the angular height of the burst center and causing a vertical and lateral deviation to appear. Before the bursts will now be on the target, it is necessary to make arbitrary vertical and lateral corrections. Using the method described in this paper all that would have been necessary upon the report of OVER, is the altitude correction dH shown in the figure.

Figure 3 illustrates a more complicated case. The battery is shooting low and beyond. The lateral deflection may or may not be correct. Assume that it is a little too great, that is the battery is shooting ahead of the target laterally. The Battery Commander must depend here upon flank observation as very probably the bursts will not be in the field of the stereoscopic observer and so sensings from this source will be missing. Suppose the observers report the shots as all over. The Battery Commander shortens the fuze but finds that he still has a vertical deflection correction to make before he is on the target. If the lateral deflection was a little too small, the fuse range change has probably corrected it. If, on the other hand, it was a little too great, the fuse range change has thrown it still further off. Thus each succeeding correction may depend upon the previous corrections and each will require study and decision in the light of those previously made. On the other hand, suppose the adjustment is being made by the methods described in this paper. The vertical and lateral deviations are corrected at the same time. This places the burst center at the point (a) in the figure. Here the bursts can be seen not only by the flank observers but also by the stereoscopic observer. Both will report all OVER. The only remaining correction is a down altitude correction dH as shown. This correction does not disturb the deflections and brings the burst center onto the target in a simple and direct manner.

No particular method of adjustment has been adopted as standard in our service at the present time. All methods are still in the experimental stage. Needless to say, in their use and in the experiments made with other methods as yet untried, every attempt must be made to eliminate all known causes of deviations; next to discover if possible the causes for the remaining deviations; and lastly when the possibilities of these studies have been exhausted, to apply simple and practical methods to shift the center of impact onto the target.

Second Battle of Bull Run

By COMMITTEE No. 1, *Coast Artillery School*, 1926-27

A GENERAL knowledge of the military situation and events preceding the Second Battle of Bull Run is necessary to an understanding of the causes and of the results of this battle.

On the day following the First Battle of Bull Run, which was fought on July 21, 1861, Major General George B. McClellan was summoned by the President to Washington and assigned to the command, under General Scott, of all troops in and about Washington. He immediately set to work to organize what afterwards became the Army of the Potomac. On November 1, General Scott, at his own request, on account of his age, was retired and McClellan was placed in command of all the armies. For the campaign of the spring of 1862, he proposed that the Army of the Potomac move by water to Urbana on the lower Rappahannock with the view of occupying Richmond before it could be reinforced by General Joseph E. Johnston who, with about 40,000 men was near Manassas Junction, to which point he had withdrawn after the first Battle of Bull Run. The President, who was strongly desirous that the operations should be directed against Johnston's force which, he believed, threatened Washington, reluctantly agreed to this plan about February 27, and on March 17 McClellan embarked from Alexandria. Due to the fact that Johnston, eight days before, had, on account of Mr. Davis's belief that his advanced position was unduly exposed to attack, begun a withdrawal first behind the Rappahannock and shortly afterwards to Fredericksburg, behind the Rapidan, McClellan landed at Fort Monroe, instead of at Urbana; and on April 4 he marched north and with about 92,000 men (3 BL 170) thus beginning the Peninsula campaign. After a delay of about a month at Yorktown, occasioned first by General Magruder, who held a line about fifteen miles long, across the Peninsula, with about 13,000 men, and later by General Johnston who reinforced him and took command, McClellan continued his movement leisurely north, after fighting a rearguard action at Williamsburg on May 5. On May 25, he occupied a position across the Chickahominy River with his lines within about six miles of Richmond, to which place Johnston had fallen back, and with his base at White House, on Pamunkey River, a branch of York River.

NOTE: R = *Rope's Story of the Civil War*. BL = *Battles and Leaders*. WR = *Rebellion Records*, the notation as to volume numbers corresponding to that employed in "*Rope's Story of the Civil War*." H = *Henderson's Life of Stonewall Jackson*.

Johnston, planning to take advantage of McClellan's position astride the river, attacked him on May 31 and June 1 with about 50,000 men, but the Battle of Seven Pines, although a hard fought one, was indecisive.

At this time McClellan's army, apart from McDowell's corps, outnumbered that of Johnston, who had about 50,000 men, by about three to two. The leading men in the Confederacy considered the Military situation to be one of extreme gravity. In Richmond, preparations were made for the instant removal of the military papers (1 R 114). The real danger would come with the movement of McDowell's corps upon Richmond and the flank of the Confederate army.

It was essential to the Confederacy that this movement be prevented if possible and the means whereby this end was eventually accomplished will now be considered.

After the First Battle of Bull Run (July 21, 1861), General Jackson was assigned to the Command of the Valley District, with Headquarters at Winchester. His force of about 10,000 men constituted the left wing of the Army of Northern Virginia; the center was under the command of General Joseph E. Johnston, the Commander-in-Chief, at Centerville.

General Banks, with about 23,000 men, crossed the Potomac at Harper's Ferry in February; and on March 11, 1862, his leading division occupied Winchester, Jackson withdrawing to Strasburg, eighteen miles farther south.

On the 17th of March, Banks started Shields with 11,000 men in pursuit, and Jackson withdrew twenty-five miles farther south to Mount Jackson. In accordance with his orders, Banks, having, as he supposed, rid the Valley of Jackson, left Shields with his Division at Winchester to guard the Valley and marched the rest of his troops to the east side of the Blue Ridge in order to cooperate with McClellan (1 R 253, 3 BL 303). Jackson, after a march of thirty-six miles from Woodstock, attacked Shields at Kernstown, near Winchester, on March 23, finally being defeated and withdrawing in good order to Swift Run Gap, in the Blue Ridge, eighteen miles southeast of Harrisonburg, with about 8000 men (18 WR 879).

His tactical failure however was a strategic success since it served to cause McClellan to return Banks promptly to the Valley, thus preventing him from cooperating with McClellan. A few days later (though probably not on account of Kernstown,) President Lincoln detached the division of General Blenker, which had not yet embarked, from the Army of the Potomac and transferred it to General Freemont in West Virginia, and, what was of great importance, issued orders to hold back McDowell's corps (I Corps) for the defense of Washing-

ton—steps which General McClellan considered seriously to endanger his operations in the Peninsula.

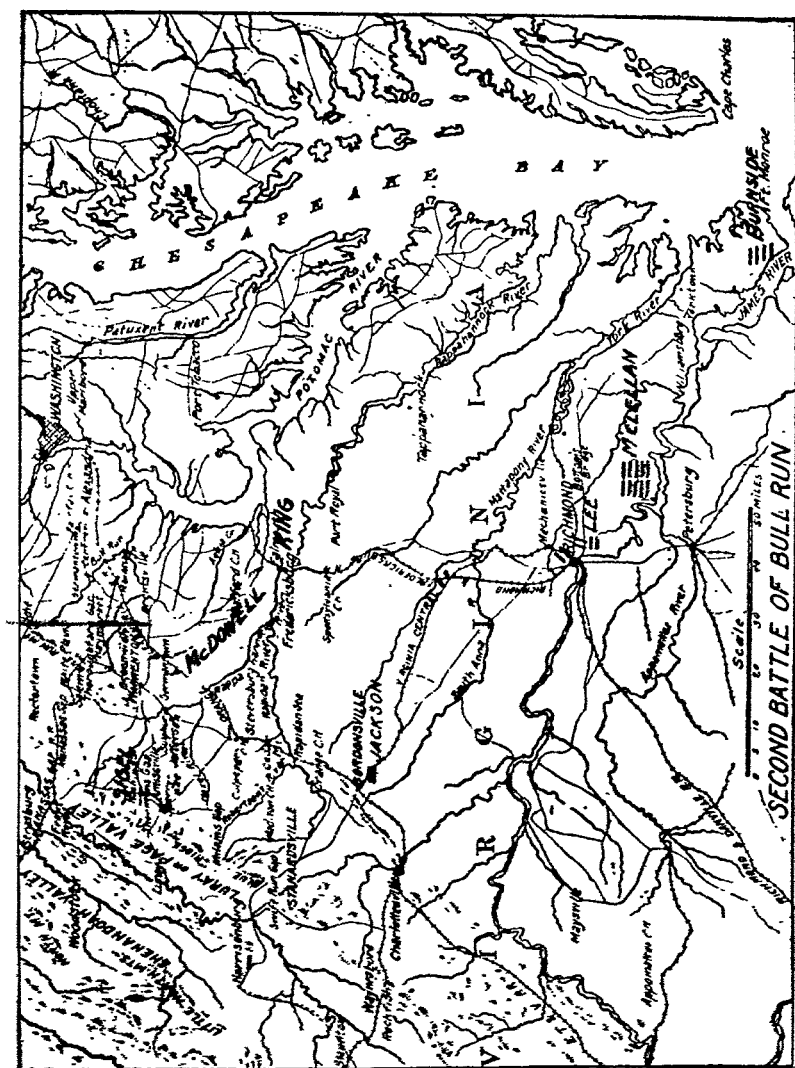


FIG. 1

Meanwhile, on March 9, Johnston had withdrawn south toward the Rappahannock, thus leaving Jackson practically isolated in the Valley.

When McClellan left Washington a few days later to take the field with the Army of the Potomac, President Lincoln issued an order

relieving him from duty as commander-in-chief of all the forces and limiting his command to that of the Army (or Department) of the Potomac (2 R 115, 5 WR 54), which was organized into four corps of three divisions each, the first corps being McDowell's.

Instead of intrusting the control of all other forces in the Virginia theater of war to some one competent commander, another order was issued dividing this theater of war into departments (so-called) General Fremont being assigned to the Mountain Department, consisting of the region lying west of the Shenandoah Valley; General McDowell being assigned to the Department of the Rappahannock; and General Banks being assigned to the Department of the Shenandoah. The President and the Secretary of War reserved to themselves the general control of the military operations in all parts of the country, and the department commanders were instructed to report directly to the Secretary of War.

On May 1, while McClellan was still besieging Yorktown, the Federal situation in the Valley was about as follows: Fremont's main body was at Franklin, in the Allegheny Mountains forty miles west of New Market (on the Shenandoah Turnpike), with one brigade of about 3500 men, under Milroy, (15 WR 7) near McDowell, a village about twenty-five miles northwest of Staunton. He had about 15,000 men in all (2 R 117). Banks' headquarters were at New Market, but he occupied Harrisonburg with the divisions of Williams and Shields, some 19,000 men (2 R 117) and some cavalry. McDowell, with 30,000 men, was opposite Fredericksburg.

Jackson, at Swift Run Gap, eighteen miles southeast of Harrisonburg, had about 8000 men (18 WR 879). A force of 8000 Confederates under Edward Johnson was observing Milroy, and a division under Ewell, 8000 strong, was near Gordonsville.

On May 1, Shields' division of about 11,000 men (18 WR 290) of Banks' corps was ordered to join McDowell (18 WR 121), thus reducing Banks' force to about 7000 men.

General Lee, who had on March 13 been intrusted with the conduct—under President Davis—of all military operations in the Confederacy (5 WR 1099), recognized fully that the real danger lay in a movement upon Richmond by the force under McDowell. Lee and Jackson both considered that "to strike a speedy blow at Banks" would "tend to relieve the pressure on Fredericksburg" (18 WR 859), and Jackson urged that he be given 5000 reinforcements with which he would attempt to drive Banks from the Valley.

Lee authorized him to make use of the troops of Ewell and Johnson and to proceed as he might think best (18 WR 875, 878). The troops

at his disposal now amounted to not over 19,000 (R 118). The subsequent series of operations, extending over the period of about six weeks beginning about April thirtieth, and constituting Jackson's Valley Campaign, is one of the most interesting and instructive in Military history.

By making demonstrations with Ashby's cavalry against Banks' detachment at Harrisonburg on the 29 and 30 of April, then marching a few miles south up Luray Valley, then crossing Blue Ridge to the railway at Mechuin's River station and there entraining his command, Jackson completely mystified and misled the enemy and fell upon Milroy and Schenck at McDowell before Banks or Fremont, or Stanton in Washington, had any notion where he was.

Banks fell back to Strasburg, and Milroy and Schenck were driven back upon Fremont at Franklin. Jackson then returned to the Valley; and his movement was so thoroughly screened by Ashby's cavalry that Fremont thought he was still in his front; and Banks had no idea where he was until he had flung his army across the Massanutten, united it with Ewell, and hurled the combined force upon Kenly, overwhelming him at Front Royal.

Then he chased Banks beyond the Potomac on May 26—the date McDowell was to have marched south to join McClellan—and threatened to cross that river, thus throwing Washington and the whole North into a panic. When President Lincoln heard of Jackson's advance down the Valley and of his attack on Front Royal, he ordered McDowell, on the afternoon of May 24, “laying aside for the present the movement on Richmond, to put 20,000 men in motion at once for the Shenandoah, moving on the line or in advance of the line of the Manassas Gap railroad” with the object of capturing the forces of Jackson and Ewell (18 WR 219). At the same time, Fremont, who was at Franklin, was ordered “to move against Jackson at Harrisonburg” in order to “cut off and capture this rebel force in the Shenandoah” (15 WR 643).

On the same date (May 24,) McClellan was notified that the President had suspended McDowell's movement to join him (12 WR 30).

Although Fremont had got within twenty-five miles, and Shields within twelve miles, of Strasburg when the head of Jackson's army was twenty-five and his rear guard fifty miles from the town, Jackson managed, with swift marching and by making demonstrations against Fremont and Shields, who did not know the whereabouts of one another, to make good his escape, with the seven-mile train of captured stores and munitions.

From Front Royal, McDowell made the mistake of sending only one division (Shields') up Luray Valley to cut off Jackson's retreat; and Shields made the mistake of stringing his division out for twenty-five miles on the road. Jackson was quick to take advantage of these blunders. He had all the bridges over the South Fork destroyed, except the one upon his line of retreat at Port Republic. That one he seized and held, thus preventing the junction of Fremont and Shields and enabling him to beat them separately and drive them back.

Here ended the pursuit of Jackson. Shields' division returned to Front Royal and was subsequently brought back to Manassas. Fremont fell back to Mount Jackson on the valley turnpike. Jackson bivouacked at Brown's Gap. Here he was in direct communication with Richmond and here he remained until June 17, when he set out on his swift and secret journey to the Chickahominy.

Jackson's counter stroke at Cross Keys and Port Republic again upset the plans of President Lincoln and Mr. Stanton. Two days before the battle of Cross Keys, the division of McDowell's corps left at Fredericksburg had been dispatched to McClellan by water; and on the very day of that battle (June 8) McDowell was ordered to join McClellan as speedily as possible with the rest of his corps. Before these orders reached their destination, Fremont and Shields had both been defeated. Shields' division was entirely broken up. Two brigades of his command were sent to the Peninsula and two more ordered to Banks' corps. King's division, opposite Fredericksburg, and Rickett's division at Manassas Junction, at the end of June constituted McDowell's entire force, which numbered at the outside 24,000 men.

"The Valley Campaign was, from the beginning to the end, only second to the campaign in eastern Virginia. It was only a strategic diversion; but of such no finer study can be found in modern war. If McDowell with his 30,000 to 40,000 troops had joined the Union Army on the Chickahominy, Richmond must inevitably have fallen and with it, in all human probability, the Confederacy. Three times was McDowell to have marched to join McClellan: first, at the beginning of April (1862) when he was held back by Kernstown; second, on May 26, when he was held back by Front Royal and Winchester; and third, on June 25, when he was held back by Jackson's disappearance after Port Republic (S 234). It resulted in preventing Blenker's Division and the greater part of McDowell's corps from joining McClellan and resulted in the substitution by the President and the Secretary of War of a scheme for the capture of Jackson's force in place of the plan—to which neither had really been favorably disposed—of uniting McDowell's command to the Army of the Potomac. It also permitted

Jackson to join Lee, who on June 1 had assumed command of the Confederate army after the battle of Seven Pines or Fair Oaks, in an offensive again McClellan. Jackson, on June 17, marched with his command, aggregating about 25,000 men, on Richmond, leaving his cavalry and one battery near Harrisonburg. So secretly did he conduct his movement that by midnight June 25 he had his corps assembled at Ashland, fifteen miles north of Richmond, before the Federals had any knowledge of his intentions or whereabouts.

The conclusion of the "Seven Days Battles," which followed, found McClellan in a strongly fortified position on July 2, at Harrison's Landing, on the James River, he having effected a change of base from White House Landing.

As a result of the ill success which had attended the attempt of the President and the Secretary of War to coordinate the movements of the three armies in three different Departments, on June 26 an order (18 WR 435) was issued by Mr. Lincoln consolidating the forces under Fremont, Banks, and McDowell and the troops in Washington, into one army, to be called the Army of Virginia, and designating as its Commander Major General John Pope, whose recent successes in the west had brought him into prominence. Pope, who was junior to all three of the corps commanders, assumed command on June 27, with headquarters in Washington. His orders required him to cover the city of Washington, to assure the safety of the valley of the Shenandoah, and so to operate on the enemy's lines of communication in the direction of Charlottesville as to draw off, if possible, a considerable force of the enemy from Richmond (16 WR 621). Believing that he could best perform this threefold mission by assembling the widely separated parts of his army, he promptly ordered Banks and Sigel (who, on Fremont's declining to serve under Pope, had been given his corps), who were then at Middletown and Strasburg, to cross the mountains by the Manassas and Luray Gaps, respectively, and take position near Sperryville, watching the Gaps. At the same time (July 3) McDowell was ordered to send Rickett's division, then at Manassas, to Warrenton to support Banks and Sigel, leaving a small force at Manassas Junction (18 WR 450, 468). Pope would have liked also to have concentrated King's division of McDowell's corps, but the Secretary of War insisted, contrary to Pope's judgment, on its remaining at Falmouth "to protect the crossing of the Rappahannock at that point and to protect the railroad thence to Aquia Creek and the public buildings at the latter place" (16 WR 21) for possible use presumably as a base for operations against Richmond (R 229). His entire active force, over and above the garrison of Washington and

detachments in the Shenandoah, was about 47,000 men (16 WR 53, 18 WR 523, R 231). On July 7 Banks was ordered to occupy Culpepper with his cavalry and to throw out pickets for twenty miles towards Gordonsville (18 WR 458), and on the fourteenth, he was ordered to seize Gordonsville and, if possible, Charlottesville (18 WR 473, 476), both important points on the Virginia Central Railroad, with his cavalry under Hatch. Hatch moved too slowly, Jackson, who had returned from the Peninsula, having occupied Gordonsville on July 19, before Hatch arrived there. Pope's object, however, had been gained in so far as effecting the depletion of Lee's army and thereby assisting McClellan was concerned.

On July 11 General Halleck, who had also made a reputation in the west, was appointed General-in-Chief and assigned to command all the land forces (14 WR 371).

Up to this time it had apparently been assumed that the Army of the Potomac was to remain on the James River until it could be reinforced sufficiently to warrant another advance on Richmond. McClellan, who had about 90,000 men, urged strongly that he be given 30,000 reinforcements with which he could attack Richmond, which he estimated to be held by not less than 200,000 men (12 WR 51). General Halleck, who visited McClellan at Harrison's Landing on July 25 and discussed the situation with him, considered it inadvisable, in view of McClellan's estimate as to the size of Lee's army, for McClellan to resume the offensive from Harrison's Landing and believed that the Army of the Potomac with 90,000 men and that of General Pope with about 40,000 men should no longer remain separated from one another (16 WR 9.) Since no reinforcements could now reach McClellan except by water, Halleck, with the President's approval, decided to withdraw the Army of the Potomac at once from the Peninsula. Over McClellan's strenuous objection the order was issued on August 3 for the withdrawal of the Army of the Potomac to Fredericksburg by way of Aquia Creek. Upon Halleck's return to Washington, Pope joined his army at Sperryville on August 1. He began to concentrate his army with the intention of moving in force in the direction of Gordonsville and Charlottesville, and after many changes in his orders and much unnecessary delay he had by about July 12 concentrated most of his forces at Culpepper, including King's division from Falmouth, which had on August 5 been replaced by Burnside, with about 8000 men, who had been brought up from the Department of North Carolina.

In the meantime Lee had reinforced Jackson with A. P. Hill's division, bringing Jackson's force up to about 24,000. This reinforce-

ment had been made when Pope began advancing toward the Rapidan and threatening Gordonsville. Jackson, who was closely watching Pope's movements hoping to find an opportunity to defeat Pope's forces before the completion of their concentration, on August 7 moved the three divisions of Ewell, Hill, and Jackson from near Gordonsville toward Culpepper.

Jackson's advance reached Cedar Mountain, about eight miles south of Culpepper, about noon of August 9 (having been delayed en route as the result of confusion caused by defects in his orders), where it encountered the cavalry of Bayard and the whole of Banks' corps which

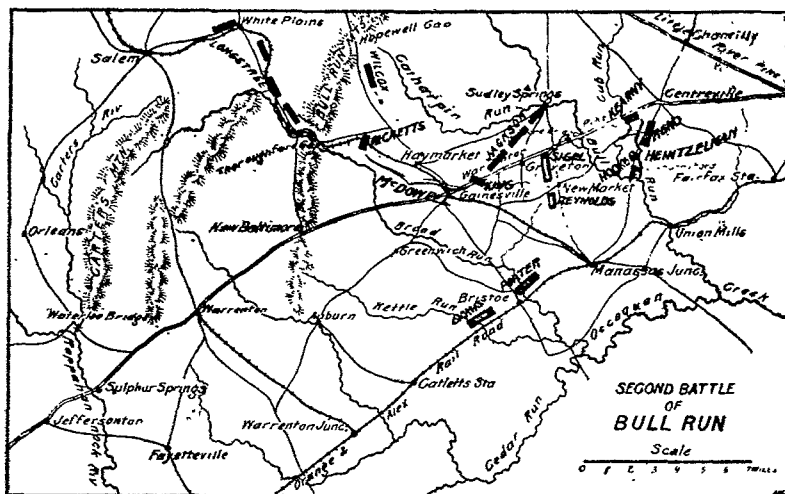


FIG. 2. POSITION OF FORCES ON AUG. 23, 1862

Pope had ordered forward to support the cavalry; McDowell, with Ricketts division, and Sigel's corps being delayed in rear. Banks received no explicit orders; Pope claimed that he ordered Banks to take up a strong position; Banks claimed that the orders contained nothing about taking up a position but instructed him merely to attack if the enemy advanced. Pope himself made no reconnaissance and had little information upon which to base his orders. Banks placed his batteries on a ridge, took up a very good position, and after several hours in comparatively useless cannonading, on seeing the enemy's infantry deploying he advanced suddenly upon them and for a brief period gained decidedly the advantage. But he had no reserves and he had not informed anyone as to his action, and when Jackson's entire forces came upon the field, the feeble corps of Banks was utterly overwhelmed and driven back with great loss (R 250).

Such, in brief, was the battle of Cedar Mountain. Banks took into action about 6800 infantry and 1200 cavalry—8000 in all. Jackson had about 20,000 men on the ground. Banks lost about 2000 killed and wounded and the Confederates lost about 1300 (16 WR 139, 180).

Both armies remained for two days facing each other. It was not part of Jackson's plan to fight a battle unless the chances were in his favor (18 WR 922, 923). He knew that as soon as McClellan's withdrawal from the Peninsula should be ascertained beyond a question, he would be joined by General Lee with his whole army. Hence, after having struck his successful blow, he wisely retired across the Rapidan toward Gordonsville. Pope, after being joined by King's division on the night of the eleventh, apparently decided to take the offensive, and he accordingly advanced to the Rapidan where he halted and where on the fifteenth of August he was reinforced by 8000 men under General Reno, from Burnside's command, this bringing his total up to not less than 45,000 men, exclusive of cavalry (18 WR 566, 509).

In the meantime, Lee, who had been observing McClellan on the James River, satisfied himself that McClellan was preparing to withdraw and without hesitation he determined to carry his army to the Rapidan, where, uniting with Jackson, he could press Pope vigorously in the hope of forcing him to a battle and gaining a decisive victory over him before he could be reinforced by McClellan's army or any large part of it (Ropes, 254). Accordingly, on August 13, Longstreet with ten brigades and Hood with two were ordered to proceed to Gordonsville, only two brigades being left to defend Richmond. Stuart's cavalry speedily followed, raising Lee's force to about 54,000 men.

"Pope's force at this time was essentially an aggregation of corps and divisions which had never before been united, had no experiences in common, and knew as little of their commander and cared as little for him as he knew and cared for them. This heterogeneous body was now to be attacked by a real army, composed of bodies of troops which had for months been acting together under the command of the most accomplished soldiers of the day and which was eager for an offensive campaign and enthusiastically devoted to its commander. The chances of victory were unquestionably in its favor if it were to be allowed a fair chance at Pope's army, and it was Pope's duty and that of his superior officer, General Halleck, to see that this chance should not be given and that Pope's command should gradually but steadily withdraw without risking a serious encounter until it should be united with the Army of the Potomac. But to this task neither Halleck nor Pope was, as we shall see, equal." (R 253.)

Lee, who arrived at Gordonsville himself on August 15, resolved to strike Pope's army before it could be joined by McClellan.

Pope's line of communications was the Orange and Alexandria railroad. This road turns sharply to the east at Culpepper, about twelve miles north of Pope's battle position astride the railroad where it crosses the Rapidan, and runs about twelve miles nearly east to Rappahannock Station, where it crosses the Rappahannock River. It was therefore perfectly possible for Lee, in a surprise movement, by crossing the Rapidan to the eastward of Pope's position, to reach Rappahannock Station with little opposition and to destroy the railroad bridge, thus leaving Pope's army in a serious situation. On August 15 he had his army massed behind Clark's Mountain and "he ordered Longstreet and Jackson to cross the river by Racoon and Somerville Fords on August 18 and move on Culpepper, while the cavalry of Stuart, crossing farther to the eastward were to make for Rappahannock Station, destroy the bridge there and then, turning to the left, form on the right of Longstreet's Corps. Pope would have been attacked in flank and rear, and his communications severed in the bargain" (2 R 257).

Pope's army was, indeed in an extremely hazardous position as Halleck repeatedly pointed out to him (18 WR 569, 576, 590). On August 17, however, he reported that he considered his position strong and that it would be very difficult to drive him from it (18 WR 589). Due to the faulty wording of an order to Stuart his cavalry was delayed. Lee, for this reason and probably on account of a shortage of supplies, over Jackson's protest, postponed the movement until the twentieth. In the meantime, the capture, by a fortunate accident, of Stuart's dispatch box by a Federal reconnoitering party, disclosed to Pope that Jackson had been strongly reinforced and revealed Lee's orders (16 WR 29, 58, 762). Pope's sense of security of the seventeenth accordingly disappeared over night and on the next day, realizing the imminent danger in which he was placed of being cut off, he withdrew his army to the Rappahannock (18 WR 591, 603).

Halleck had it in his power, by ordering all the troops from the Peninsula to disembark at Alexandria, instead of at Aquia Creek, and by also directing Pope to fall back towards Manassas, and if necessary, across Bull Run, without hazarding a battle, to unite the Army of Pope and that of McClellan without incurring the slightest risk or loss. But instead of this he directed Pope, on August 21, "Fight like the devil till we reinforce you. Don't yield an inch if you can help it" (16 WR 56, 57), in spite of Pope's evident dissatisfaction (16 WR 58, 59, 32, 33). Halleck, for no apparent reason except that he was unwill-

ing to give up the government property at Falmouth and Aquia Creek or to allow the Orange and Alexandria railroad to be broken up, insisted on Pope's running this wholly unnecessary risk (2 R 259). On the twenty-second, Jackson sent Early's brigade across the river at Sulphur Springs, and Longstreet made a demonstration at Rappahannock Station. After reinforcing Early on the twenty-third with another brigade, Jackson, on the twenty-fourth, withdrew across the river. Meanwhile Stuart, on the twenty-second, crossing the Rappahannock near Waterloo bridge and making a march of sixty miles in twenty-six hours, made a bold raid around the Federal right on Catlett's Station, capturing Pope's dispatch book, containing detailed information as to his strength, dispositions, and expected reinforcements, and disclosing his belief that the line of the Rappahannock was no longer tenable. Pope apparently concluded that the retreat of Stuart's cavalry, combined with that of Early, indicated that the five-day effort of Lee to turn his right flank, which had been prevented chiefly by heavy rains which rendered the Rappahannock very difficult of passage, had been definitely abandoned.

At this time Pope's army had been reinforced, by the corps of Heintzelman and Porter and by other troops from the Army of the Potomac to a strength of 70,000-80,000 (2 R 262), including Banks' corps which did not participate in any of the ensuing engagements. Considering the troops under Burnside, at Falmouth, the corps of Franklin and of Sumner (from the Army of the Potomac), which were disembarking at Alexandria and at Aquia Creek, respectively, (but both of which McClellan, who arrived at Alexandria on August 20, reported as "not now in condition to move and fight a battle") (18 WR 709) and other troops available in Washington, the total Federal troops which could be concentrated on the Rappahannock within a few days aggregated probably at least 130,000 men (S 244), Lee's strength was about 49,000 (2 R 261; 2 BL 500).

The positions of Pope's command on the night of August 26 was about as follows: Heintzelman's corps was at Warrenton Junction (but without wagons, artillery, or horses); Porter's corps and Reno's corps were near the same place; McDowell's corps and Sigel's corps were at Warrenton, under command of McDowell; and Banks' corps was at Fayetteville as a reserve. (2 BL 463.)

On August 24, Lee moved his Headquarters to Jefferson, where Jackson was already encamped, and in a conference, with Pope's captured correspondence before them, a plan of operations was determined upon.

"A defensive attitude could only result in the Confederate Army being forced back by superior strength; and retreat on Richmond would be difficult for the Federals held the interior lines. The offensive seemed out of the question. Pope's position was more favorable than before. His army was massed and reinforcements were close at hand. His right flank was well secured by the Bull Run Mountains. The ford at Sulphur Springs and the Waterloo bridge were both in his possession; and his left was protected by McClellan's forces at Aquia Creek. Instant action was imperative." (2 H 223.)

Lee's decision was to divide his army. Jackson, with his command and some of Stuart's cavalry—some 24,000 in all, by a circuitous route, crossing the Bull Run Mountains at Thoroughfare Gap, was to strike

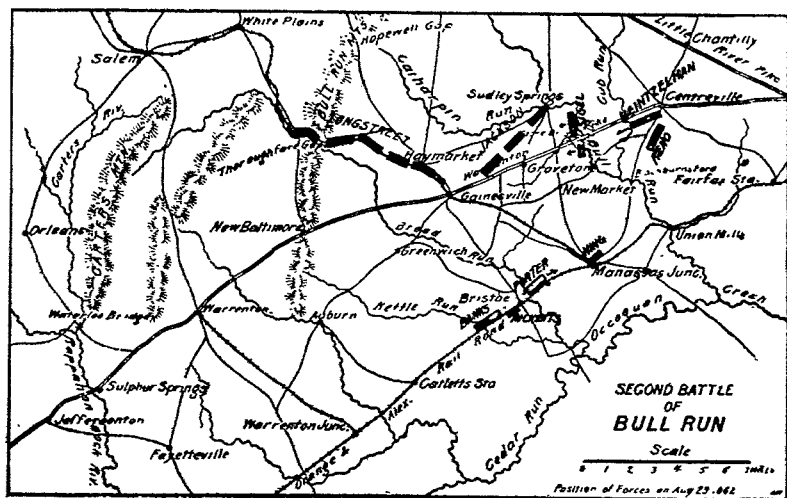


FIG. 3. POSITION OF FORCES ON AUG. 29, 1862

the railroad in Pope's rear. While this movement was in progress, the remainder of the army, about 25,000—under Longstreet was to hold the attention of Pope on the river until that officer should abandon his position, which it was expected he would do, in order to save his communications, when the true character of Jackson's march should become known to him; and then, as soon as the Federal army should retire, Longstreet was to follow Jackson and the two fractions of the army were to be reunited (2 R 261, 2 H 124).

On the evening of the twenty-fourth, Jackson began his preparations for the most famous of his marches. His troops were quietly withdrawn from before Sulphur Springs, and Longstreet's division, unobserved by the Federals, took their place. Three days' cooked rations.

were carried in the haversacks and a herd of cattle, together with the green corn standing in the fields, was relied upon for subsistence. Starting before dawn on the twenty-fifth, Jackson marched through Amissville and Orleans and bivouacked about midnight that night at Salem after a march of twenty-sixth miles. Every precaution was taken to conceal the movement. The first part of the march was observed by the Federals and Pope reported it to Halleck (1 BL 461), but Pope arrived at the completely erroneous conclusion that Jackson must be bound for the Shenandoah Valley by way of Front Royal (18 WR 653, 665.) No efficient effort was made to follow Jackson's movements with cavalry or otherwise, and Pope apparently considered that the rest of Lee's army would soon follow Jackson "to the west and northwest." (16 WR 67, R 264.)

On the twenty-sixth, Jackson, starting before dawn, passed through Thoroughfare Gap and, with Stuart's cavalry as a right flank guard and Munford's cavalry in advance, marched to Gainesville. From here he could have reached Manassas Junction, where Pope's depots were located, within an hour, but he marched to Bristoe Station, about seven miles south of Manassas Junction, in order apparently to destroy the railroad bridge at that point so as to obstruct any rapid rail movement from Warrenton Junction. He bivouacked here for the night after a day's march of twenty-five miles, sending two regiments, under Trimble and Stuart, on to Manassas Junction, which they captured about midnight, surprising the small guard which Pope had left as a protection against raiding cavalry.

The next morning (August 27), Hill's division joined Trimble, Ewell's division remaining at Bristoe as a rear guard. Jackson permitted his troops to devote the day to pillaging and destroying the enormous amount of supplies and ammunition in the depots. Such an opportunity occurs but seldom in a soldier's service and the satisfaction of the hungry and ill-clothed Confederates was doubtless not lessened by their general knowledge of Pope's message to his army upon taking command, in which he had stated, among other things, "Let us study the probable lines of retreat of our opponents, and leave our own to take care of themselves."

"The news of Jackson's raid on the railroad was brought to Pope's attention early on the evening of the 26th. At first he thought it must be the work of a small force, but on further information arriving he perceived the gravity of the situation and on the morning of the twenty-seventh he issued orders for the abandonment of the line of the Rappahannock" (2 R 266; 2 BL 464). McDowell, with his own corps and that of Sigel and the division of Reynold's, was ordered

to Gainesville; Reno, followed by Kearny's division of Heintzelman's corps, was ordered to move to Greenwich to report to McDowell there; Hooker's division of Heintzelman's corps was moved along the railroad towards Manassas Junction to drive away the enemy and re-open communications with Alexandria. During the afternoon, Hooker encountered Ewell at Bristoe Station and attacked him, and Ewell, who was under orders to retire if hard pressed, withdrew to Manassas. Hooker having reported that his ammunition was exhausted, Pope ordered Porter to march during the night to Bristoe and directed Banks to take charge of all the trains at Warrenton Junction.

On the evening of the twenty-seventh, Pope considered that he had definitely located Jackson's command at Manassas Junction and that he had completely interposed between Jackson and Lee's main body (2 BL 466). In the expectation that Jackson would remain at Manassas Junction, Pope, during the evening, ordered Kearny to march "at the earliest blush of dawn" to Bristoe, thus uniting the two divisions of Heintzelman's corps, and concentrating that corps and Porter's corps at Bristoe. Reno, with his own and Steven's division, was ordered to march from Greenwich direct to Manassas, and McDowell, with his corps, Sigel's corps, and Reynold's division, was ordered to move from Gainesville at dawn also to Manassas. Had Jackson remained at Manassas, these orders would have brought almost the whole of the Federal Army upon him in the forenoon of the next day (28th). Pope stated, "We shall bag the whole crowd if they [his own troops] are prompt and expeditious." He "took no account however of the probability that Lee, with Longstreet's corps and the rest of the army, would immediately follow Jackson's march and endeavor to unite with him as soon as possible; but McDowell, recognizing the importance of delaying the junction of the two bodies of the Confederate Army, took the responsibility of detaching the division of Rickett's to Thoroughfare Gap, there to take position. This action was not however approved by General Pope" (2 R 268, 16 WR 336, 37, 38,), and his movements left this gap entirely unprotected and Longstreet bivouacked the night of the twenty-seventh at White Plains.

Jackson, however, did not remain at Manassas to be destroyed. Pope's movements on the morning of the twenty-eighth were slow. When he arrived at Manassas about noon he found the place deserted and he could learn nothing of Jackson's movements. About 4:00 p. m., however, he learned that the railway at Burke's Station, about twelve miles from Alexandria, had been cut and that Hill had been at Centerville. Orders were followed by counter orders. At 4:15 p. m. he issued orders directing all his troops to march on Centerville, whither

he supposed Jackson's entire force had gone (16 WR 360, 361). Sigel, who was not far from Manassas, and Reynolds countermarched toward the Warrenton turnpike but did not cross Bull Run; Hooker, Kearny, and Reno, forming the right wing, marched to Centerville via Blackburn's Ford and bivouacked there for the night. King's division of McDowell's corps, which was not far south of the Pike when it received the order to march on Centerville, was directed by McDowell, who was to constitute the left wing, to march east on the Pike to Centerville. McDowell then rode off, leaving his command, to see Pope and confer with him.

In the meantime, Jackson, after spending the day of the twenty-seventh destroying the stores at Manassas, moved north by three roads during the night. Jackson's arrangements for deceiving the enemy, for concealing his line of retreat, and for drawing Pope northward on Centerville had been carefully thought out. Taliaferro, as soon as darkness fell, had moved to near Groveton; at 1:00 a. m. Ewell, following Hill, marched along the south bank of Bull Run to Blackburn's Ford, where he crossed and, moving upstream, joined Taliaferro by the Stone Bridge; Hill after crossing at Blackburn's Ford marched to Centerville and leaving there at 10:00 a. m. he joined Hill and Talliaferro near Groveton (H 143) via the Warrenton pike. The route taken by Hill not only served to avoid interference with the marching columns (2 R 269) but also served to mislead Pope into thinking that Centerville was the destination of Jackson (2 H 142). Jackson thus succeeded, on the twenty-seventh, in destroying the Federal depot at Manassas, in interrupting Pope's telegraph communications with Halleck for four days (August 26 to 29, inclusive) (18 WR 724), during which time Halleck heard nothing from Pope (as the result of which the divisions of Franklin and Sumner were not sent to reinforce Pope,) also in concentrating, on the morning of the twenty-eighth, all his divisions on the north side of Warrenton pike, within twelve miles of Thoroughfare Gap on a line by which Lee could join him, or on a line of retreat through Aldie Gap in case Thoroughfare Gap should be blocked. He was, furthermore, established on the enemy's flank in a position from which he could strike effectively. "It was essential that he should be prepared for offensive action. The object with which he had marched upon Manassas had only been half accomplished. Pope had been compelled to abandon the strong line of the Rappahannock, but he had not yet been defeated; and if he were not defeated he could combine with McClellan and advance in a few days in overwhelming force. Lee looked for a battle with Pope before he could be reinforced, and to achieve this end it was necessary

that the Federal commander should be prevented from retreating further" (2 H 142). Jackson's next object was to prevent such a retreat.

King's division of McDowell's corps, which had been ordered by McDowell on the twenty-eighth to march east on the Warrenton Pike to Centerville, was encountered by cavalry and its presence reported to Col. Bradley Johnson, commanding one of Taliaferro's brigades, who promptly reported it to Jackson. Jackson immediately placed the divisions of Ewell and Taliaferro (about 8000 men) in concealed positions in the woods north of the Dogan house, and as King's division (about 10,000 men), marching without flank guards, approached on the road, they were attacked about 5:30 p. m. (2 H 146). A fierce fight ensued until dark with heavy losses on both sides. Generals Ewell and Taliaferro were both wounded. The attack was a complete surprise to the Federal generals, and, owing to the length of the column and to the advanced hour of the day two of King's four brigades took no part in the battle (2 R 272). The Federals, however, surprised and unsupported, bore away the honors.

The news of this action was at once sent to Pope and he jumped to the conclusion that Jackson had quit Centerville and was in full retreat for Thoroughfare Gap, and that King had met the head of his column. Pope felt confident that he could, by a prompt concentration, surround and overwhelm him. He therefore issued orders at once for the assembling of his troops on the Warrenton pike. These orders indicate clearly that he believed Jackson had retreated and that it would not do to follow him even as far as Gainesville, as the army would have to be brought back at night to Centerville to obtain needed supplies. It is also plain that he believed that if, contrary to his expectation, Jackson should be found in position the rest of Lee's army would not have joined him (2 R 279).

Meanwhile, the head of Longstreet's column had reached Thoroughfare Gap at 3:00 p. m. August 28. Finding the eastern end of the pass blocked by Rickett's division, Longstreet sent detachments round by way of Hopewell Gap and a cattle trail to turn Rickett's position, and Ricketts withdrew, joining King's division that night, thus reuniting McDowell's corps. But McDowell was away looking for Pope; so King, being without communications with either his corps commander or Pope and having received no orders since those of Pope directing him to march on Centerville, started at 1:00 a. m. for Manassas, and Ricketts, in view of King's action, marched at the same time on Bristoe. In the absence of orders from McDowell his other two divisions under Sigel and Reynolds, who were within supporting distance to the right, did not participate in the action. McDowell was

later censured by a Court of Inquiry for leaving his corps.

On the morning of the twenty-ninth Pope's troops, worn out after long and often useless marching, were badly scattered. Sigel's corps and Reynold's division, near Groveton, were the only troops in close proximity to Jackson. The corps of Banks and Porter and Rickett's division of McDowell's corps were at Bristoe; King's division, of McDowell's corps, was at Manassas, as was also Hooker's division of Heintzelman's corps; the other division of Heintzelman's corps (Kearny's) and Reno's two divisions were near Centerville. There was nothing to prevent Longstreet from marching through Gainesville to join Jackson.

With a view to preventing Jackson's escape, Sigel and Reynolds were ordered to attack Jackson at daybreak (of the twenty-ninth); Heintzelman and Reno were ordered to reinforce them, and Porter was ordered to Centerville (16 WR 76) and later to move with his corps and King's division of McDowell's corps upon Gainesville. Porter was east of Manassas on his way to Centerville when he received his second order. He at once turned about and marched on Gainesville. About 11:00 a. m. he was joined by McDowell, and about noon they received a joint order from Pope directing them both to move towards Gainesville but adding ". . . I desire that as soon as communication is established between" the forces on the right "and your own the whole command shall halt. It may be necessary to fall back behind Bull Run, at Centerville, tonight. I presume it will be so on account of our supplies." He stated further: "If any considerable advantages are to be gained by departing from the order it will not be strictly carried out," and also: "The indications are that the whole force of the enemy [*i. e.*, Lee's main army] is moving in this direction at a pace that will bring them here [Centerville] by tomorrow night or the next day" (16 WR 76, 520). This order indicated fairly clearly that Pope considered that Jackson was retreating toward Gainesville, that he did not think there would be a battle but that he wished the two wings of his army to establish communications with one another, and that he expected to fall back to Centerville that day and take up a strong position before Lee could arrive. About the time McDowell received this order he also received a message from General Buford, who commanded the Union cavalry on the right, informing him that seventeen regiments, one battery, and five-hundred cavalry had passed through Gainesville about 8:45 a. m. McDowell and Porter, after conferring, decided that the situation was not known to Pope when he wrote the order, that it was impossible to carry it out, and that it was desirable to avail themselves of the latitude given them to vary from it.

McDowell decided to take King's division and, later, Rickett's when it arrived from Bristoe, up the Sudley Springs road toward Pope's main army near Groveton from which sounds of artillery firing could be heard (16 WR 513-535). Porter, encountered enemy troops at Dawkin's Branch and he then deployed part of his command and halted. These troops were Longstreet's wing forming on the right of Jackson.

In the meanwhile a battle was in progress to the north of the Warrenton pike. Jackson had placed his command in the cut of an unfinished railway, extending from near Sudley Springs south westerly to Groveton. His line was about two miles long. Sigel and Reynolds

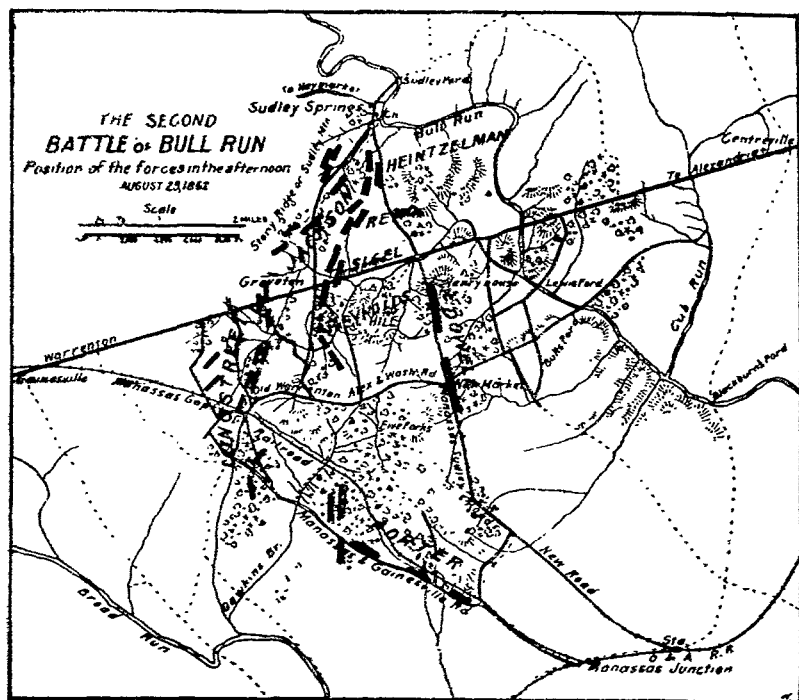


FIG. 4

had attacked him first; later they had been joined by Heintzelman and Reno. In the absence of McDowell, Porter, and Banks, Pope had present only about 25,000 men, and due to delays in the marching of his troops, his force was not all on the field until about twelve o'clock. Jackson's command aggregated about 17,000 (2 R 282; 2 H 168). There was much artillery firing, but little or no musketry firing, during the forenoon and it was not until two o'clock that the action became serious. All during the afternoon portions of Jackson's line

were assaulted; but the assaults were not coordinated attacks; first one division or part of a division, would charge, and then another. A magnificent charge led by Grover, a brigadier in Hooker's division, came near achieving a great success but it failed from lack of proper support (2 R 283). The weak part of Jackson's line was his left flank. "Pope might have turned this early in the afternoon when Heintzelman and Reno came up. But he made no attempt to do this" (2 R 284). He made none but frontal attacks. At dusk King's division of McDowell's corps arrived and took part in the action; it was driven back by a part of Longstreet's force. The Federal attacks had everywhere been repulsed and the battle was over for that day.

Pope was not aware during the battle that Longstreet had arrived and had taken his place on Jackson's right. Toward sunset he had sent an order to Porter to attack Jackson's right, not knowing that Longstreet's whole command stood between Porter, who, with about 9000 men, was in an isolated position on the Federal left flank, and Jackson's right. (Note: Pope preferred charges against Porter for not obeying this order and he made such other charges in his report (16 WR 40) that the latter applied for a court martial which sentenced him to be dismissed, the sentence being approved by President Lincoln on January 21, 1863. In 1878 Porter succeeded in obtaining a new hearing before a court of inquiry which held extensive hearings and examined many Confederate records and heard the testimony of a number of leading Confederate generals, among them General Longstreet. This court unanimously and completely exonerated him, and he was restored to the army (16 WR 505-506; 17 WR).

During the afternoon Lee repeatedly contemplated an attack by Longstreet against the Federal left, but Longstreet, to whom Stuart had reported the approach of Porter toward Longstreet's right, insisted that, the day being well spent, it would be better to make a reconnaissance only and be prepared for battle at daylight the next morning, and Lee reluctantly agreed (2 BL 519, 520). Had Lee not deferred to Longstreet's recommendation it is not improbable that the results of such an attack would have been of great importance to the Confederates.

During the night the Confederates fell back to their original line of battle from the advanced position they had reached on following up the repulse of the enemy. This led Pope, as well as McDowell and Heintzelman, the next morning (August 30) to believe that Lee had retreated towards Gainesville. Pope accordingly issued at noon an order for the "vigorous pursuit of the enemy" and he assigned McDowell to the "command of the pursuit," in which his own corps, Rey-

nold's division, and Porter's corps were to be employed (16 WR 361; 18 WR 741).

General Pope's account of the matter in his report is, however, a very different one (2 R 286). He states that Confederate reinforcements were

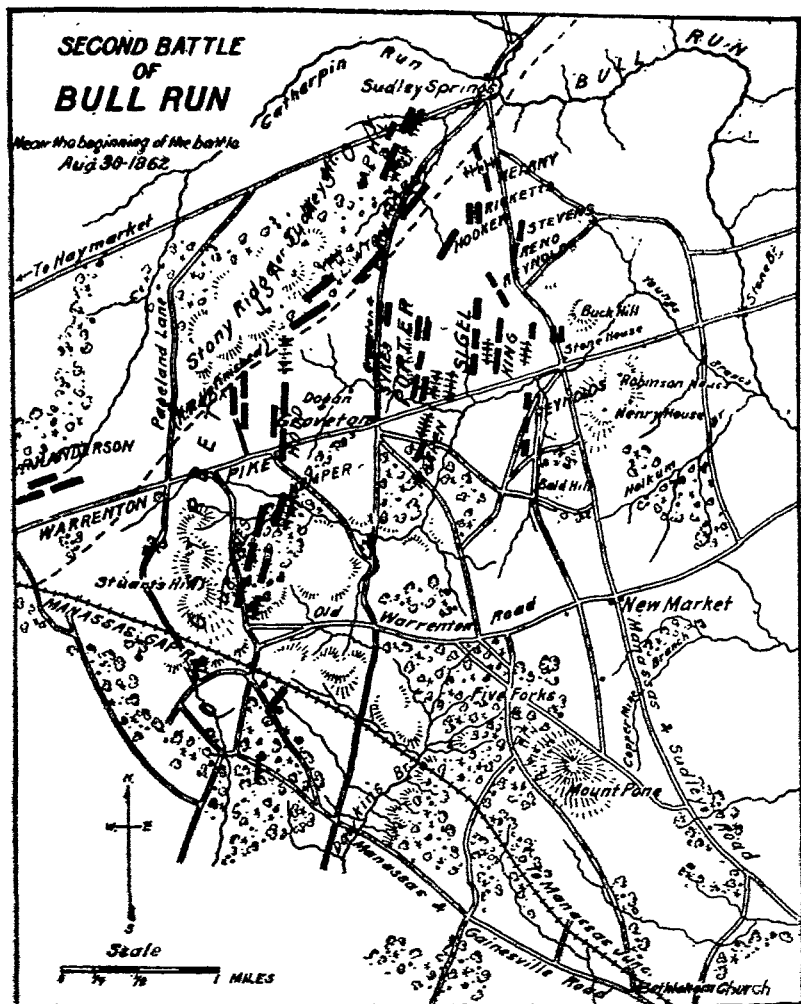


FIG. 5

arriving constantly until noon of the thirtieth, by which time he was confronted by forces greatly superior to his own and that "every moment of delay increased the odds against us and I therefore advanced to the attack as rapidly as I could bring my forces into action" (16 WR 42).

"There can be little doubt that, at the time, Pope thought the enemy were retreating and that he could pursue them. In this view Pope was completely mistaken. So far from wishing to avoid a conflict the thing above all others that Lee wanted was a battle before any further additions from McClellan's army could join Pope. Pope utterly disbelieved the reports which were early brought to him of Longstreet's assembling his forces south of the turnpike with the intention of attacking the left of the Union army. He accordingly massed nearly his entire army north of the Warrenton turnpike. His whole plan was based on the belief that the Confederates were retiring; it was not a plan of an offensive battle against an enemy in position" (2 R 288). Porter was to move on the pike, followed by Reynolds. Rickett's division and Heintzelman's corps were to follow on the road which runs from Sudley Springs to Haymarket, nearly parallel to the Warrenton pike and about two miles north of it.

Hardly had the troops started when it was discovered the Confederates were not retreating but were in position awaiting attack. The Confederate line formed an obtuse angle extending Jackson's position south across the Warrenton Pike to the high ground and woods between the pike and the Manassas Gap railroad. Their artillery was placed on high ground between the two wings where it swept the ground that Porter's troops must advance over as they attacked (16 WR 548, 577). To provide for this changed situation, Reynolds had been withdrawn and placed on Bald Hill, with one brigade of Sigel's, and other troops had been placed at Henry House Hill to cover the Union left and secure the line of retreat.

This left Porter with practically no support and although Pope was no doubt aware of the changed conditions he made no change in his orders to Porter.

Porter attacked Jackson but was overwhelmed and repulsed. Thereupon Longstreet attacked, advancing his right, taking Bald Hill from which Reynolds had meanwhile been withdrawn to support Porter.

Attempts to retake the hill were unsuccessful. The Confederates made repeated efforts to take the Henry House Hill but failed.

Jackson, after repulsing the attack, pushed forward north of the pike. This line had been weakened by troops withdrawn to reinforce the Union left so that it was unable to resist Jackson's advance and was driven from the field.

The fighting lasted until dark and the Federal forces retired from the field, the line of retreat being secured through the retention of Henry House Hill.

This ended the Second Battle of Bull Run.

The next morning, August 31, Pope's army took position on the heights of Centerville. Banks rejoined with his corps of 9,000, which had taken no part in the battle, but had brought the wagon-train with much-needed supplies safe to Fairfax Court House. Franklin and

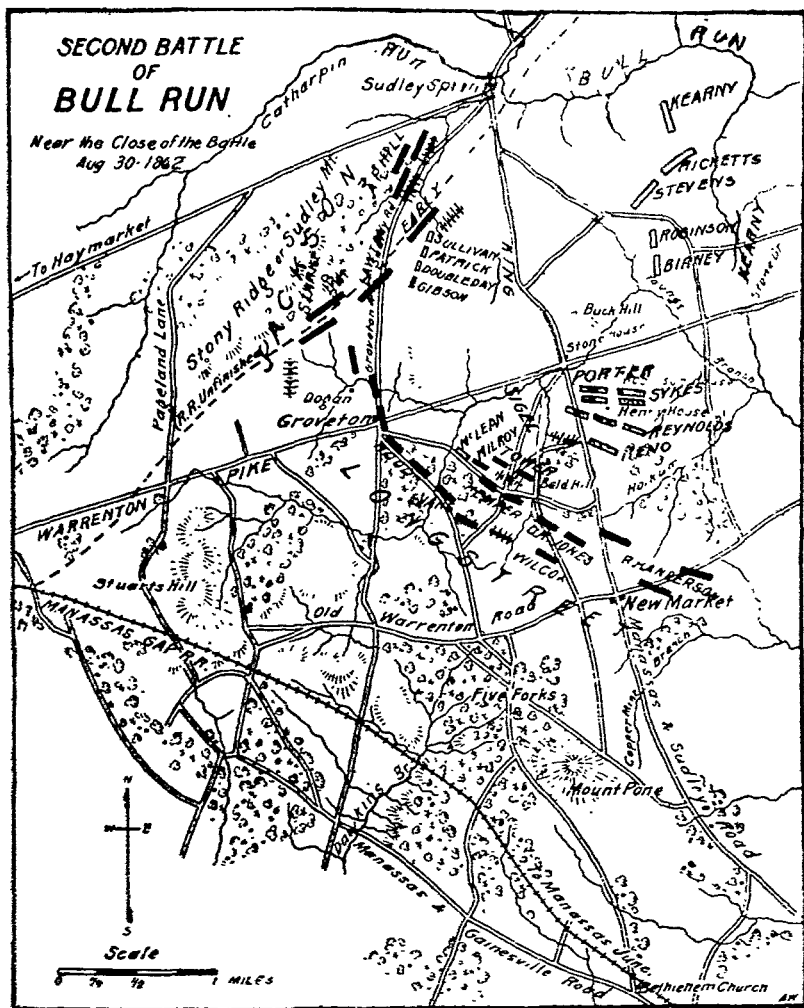


FIG. 6

Sumner, also, with their corps from the Army of the Potomac, reported to Pope at Centerville, having marched out from Alexandria.

Stuart had started with his cavalry at daybreak to recover touch with the Union Army, and he soon reported to Lee that it was in

position at Centerville. Lee resolved to turn the Union right by the Little River Turnpike. So Jackson moved out in the afternoon (Sunday, August 31) by way of Sudley Springs, and that night bivouacked at Pleasant Valley, about four miles west of Chantilly on the Little River Turnpike. Longstreet followed later in the day, but halted for the night near Sudley Springs.

Foreseeing the possibility of a turning movement by way of the Little River Turnpike, Pope sent out a brigade of infantry early in the morning of September 1 to reconnoiter—there being actually no cavalry with his army fit for service. Before long he received report that such a movement of the enemy was in progress. At noon, therefore, he ordered McDowell to march his corps rapidly to Fairfax Court House and to occupy Germantown. Shortly afterwards he dispatched General Stevens with two brigades across the fields to the Little River Turnpike with orders to “take position across it” and to hold the Confederate force in check.

At Ox Hill, Stevens encountered Jackson’s command, and a desperate fight took place. Stevens was killed almost at the start. Finally Kearny arrived with his division; still the Union force was greatly outnumbered by the Confederates. Kearny, mistaking the Confederate troops for Federals in the woods and the darkness of evening, rode right into their midst and was killed. Night put an end to the combat, which is known as the battle of Chantilly.

During the night the Union troops retired to Germantown and Fairfax Court House. Upon the recommendation of General Pope, Halleck issued orders on September 2 for the withdrawal of the Union army to the intrenchments in front of Washington, there to reorganize. Pope reported that evening to Halleck that the troops would be within the works by the morning of the third. Pope’s campaign in Virginia was at an end.

The losses of the whole campaign, most of which took place in the great battle, were as follows:

Confederates: 1553 killed, 7812 wounded, 109 missing; total 9474.

Federals: 1747 killed, 8452 wounded, and 4263 captured or missing; total, 14,462.

The Confederates collected thirty guns and 20,000 small-arms from the field of Bull Run.

COMMENTS

Pope as Commander.—Pope did not receive “just impressions” and estimate “things and objects at their real value.” He did not form right conclusions; and with each new report he changed his mind concerning the situation and issued new orders. He wore his men out

with marching and countermarching, and destroyed their confidence in himself with vacillating and contradictory orders. He never had a true conception of the situation from the time he learned of Jackson's movement northward, until he reached the fortifications of Washington with his beaten army. He never discerned the opportunity presented him to destroy the two fractions of Lee's army separately (S 257). He can hardly be charged with want of energy but his energy was spasmodic. His power of self-deception was fatal. He was absolutely incapable of putting himself in his enemy's place, and time after time he acted on the supposition that Lee and Jackson would do exactly what he most wished them to do. As a tactician Pope was incapable; as a strategist he lacked imagination, except in his dispatches (2 H 186).

Strategic considerations.—Considering Lee's operations in this campaign as a whole, his strategy conformed to the Principle of the Objective, since throughout the operation his definite objective was Pope's army. Jackson's raid around Pope's flank and rear and his capture of Manassas Junction and of the large amounts of supplies there stored, while a spectacular operation, could not in itself have exercised a decisive effect in the defeat of Pope's army. However, this raid and Jackson's subsequent movements served to cause Pope to draw away from reinforcements from McClellan at Aquia Creek, to interrupt all communications between Pope and Washington for four days, to prevent the dispatch to him of available reinforcements from Washington, to mystify and confuse Pope, and to result in a disorganization and separation of his command which favored its defeat by the combined Confederate force.

Lee's strategy conformed in a striking manner to the Principle of the Offensive, since throughout the operation the initiative was with the Confederates who compelled the Federals to conform to their actions; it conformed to the Principle of Movement, since the general character of the operation was to effect a change of the battle front from the terrain and locality selected by the Federals to another locality more disadvantageous to them; it conformed to the Principle of Surprise and Security, since Jackson's outflanking movement, due to its speed, to the protection afforded by Bull Run Mountain, and to the effective screening by Stuart's cavalry, was a complete strategic and tactical surprise, and since, due to Jackson's expedients to confuse Pope as to his direction of movement after leaving Manassas, Pope was confused and bewildered as to Jackson's intentions; it conformed to the Principle of Cooperation, since throughout the operation there existed unity of command under Lee and excellent cooperation between Jackson and Longstreet. It violated the Principles of Mass (or Superior

Force) and of Economy of Force since it involved a detachment of a large part of Lee's force in the face of the enemy; it conformed to these principles, however, in that Lee utilized effectively his interior lines of communication to concentrate his entire forces against each of his two adversaries, McClellan (on the Peninsula) and Pope (on the Rapidan) and in that the purpose and the effect of the plan was to unite Lee's entire force against Pope's partial force before fighting the decisive battle. It violated the Principle of Simplicity in that it involved a junction of two forces on the battle field—one of the most difficult of all operations.

Considering the Federal operations as a whole, they violated the Principle of the Objective in that the mission assigned Pope required him, without real reason, to hold Falmouth to protect the government storehouses at Aquia Creek, thus restricting him in his operations against Lee's army and resulting in the extension of his front over a distance of forty miles. The Principle of Security was violated by Pope in his initial advance to the Rapidan River, and, later, by Halleck in insisting that Pope should hold the line of the Rappahannock River until he could be reinforced by McClellan, instead of withdrawing him towards Alexandria and awaiting there reinforcements before engaging Lee in decisive combat. This Principle was violated by Pope in his complete failure to maintain contact with Jackson either in his out-flanking march or in his movements after leaving Manassas Junction, and to learn of Longstreet's arrival on the battle field. He violated the Principles of the Offensive, of Mass, and of Economy of Force when he failed entirely to realize the importance of blocking Longstreet's passage through Thoroughfare Gap with a small force and of preventing or delaying his junction with Jackson until he could attack Jackson with a greatly superior force. Pope, in his failure to concentrate all the available elements of his command against Lee; Halleck, in requiring Pope to protect Falmouth; and Halleck and McClellan, in failing to reinforce Pope with the divisions of Franklin and Sumner, violated the Principles of Mass and of Cooperation.

Judged by the results actually attained, Lee's strategy was brilliant. Judged by the Principles of War it was perilous. That it succeeded was due in great part to the fact that many and serious errors were made by the Federal commanders. It cannot be regarded as a safe example for future commanders. In this campaign, however, the character of the Confederate plans was undoubtedly determined largely by a careful consideration of the characteristics of the Federal leaders, including not only Pope but Halleck and Mr. Stanton. In all probability the plans that Lee employed against Halleck and Pope would never

have been attempted against Grant, and this campaign is a striking illustration both of the essential soundness of the accepted Principles of War as abstract principles and of the fact that the most successful application of these principles *as a whole* in a given situation may be effected by a violation of one or more of them. Study and indoctrination will serve to indicate to a commander when his plan departs from these principles; the ability to decide correctly when to make such a departure, however, and the courage to carry out such a decision, once made, cannot be acquired by study alone.

Ropes says, "Unless gifted with that moral fortitude which Napoleon ranks higher than genius or experience, no general could have succeeded in carrying Lee's designs to a successful issue. In his unhesitating march to Manassas Junction, in his deliberate sojourn for four and twenty hours astride his enemy's communications, in his daring challenge to Pope's whole army at Groveton, Jackson displayed the indomitable courage characteristic of the greatest soldiers."

It is known that Jackson was a close student of the campaigns of Napoleon and that he kept in his personal effects throughout his own campaigns a copy of Napoleon's Maxims. In this connection the following quotation from General John D. Imboden is of interest:

"Jackson's military operations were always unexpected and mysterious. In my personal intercourse with him in the early part of the war, before he had become famous, he often said there were two things never to be lost sight of by a military commander; "Always mystify, mislead, and surprise the enemy, if possible, and when you strike and overcome him, never let up in the pursuit so long as your men have strength to follow; for an army routed, if hotly pursued, becomes panic-stricken, and can then be destroyed by half their number. The other rule is, never fight against heavy odds, if by any possible manœuvring you can hurl your own force on only a part, and that the weakest part, of your enemy and crush it. Such tactics will win every time, and a small army may thus destroy a large one in detail, and repeated victory will make it invincible." (2 BL 297.)

Tactical considerations.—From a tactical standpoint, it is of interest to note a few of the more important respects in which the tactics used in this campaign, and in general throughout the Civil War, differed from modern conceptions and practice. The use of coordinated attacks, in the modern sense of the term, was practically unknown. As a rule, the attack was by division or brigade, in successive waves against a given portion of the front, or against successive portions of the front in turn. This left the decision as to whether or not to attack, and if so the time for the attack, in many cases, to the individual subordinate

commander. It rendered coordination of action difficult and often resulted in piece-meal action, as was the case in both the battles of Cedar Mountain and Second Manassas.

While Jackson was a master in the use of turning movements, enveloping attacks in the modern sense of the term were rarely used except in local phases of the action. Reliance appears to have been placed chiefly upon frontal attacks.

The fact that Pope was completely ignorant of Longstreet's presence on the twenty-ninth is illustrative of the practice of initiating attacks without that fairly definite knowledge of the positions of the flanks of the enemy positions which is today regarded as an essential prerequisite to the issue of an attack order.

The proper use of the combined arms in battle was, in general, at this time, exceptional. Jackson appears to have been almost alone at this time in his realization of the importance of such team work. Himself an experienced artillery officer, he invariably gave his personal attention to the dispositions of his artillery, and in his use of his cavalry under Ashby and later under Stuart for reconnaissance and screening purposes he has never been surpassed.

In the accounts of this campaign almost nothing is said of the work of the Union cavalry. At the beginning of the campaign, Pope, in a letter to Halleck, dated August 5, refers to the "large force of cavalry at" his "disposition." (18 WR 535, 536.) Initially his cavalry functioned satisfactorily. But so extravagant were his demands on the mounted arm that before the Battle of Manassas, according to General Pope (2 BL 491), "Our cavalry, under Buford and Bayard, was completely broken down, and both of these officers reported to me that not five horses to the company could be forced into a trot—It was impracticable therefore to use the cavalry to cover our front with pickets or to make reconnaissances of the enemy's front."

"It should have been the business of the cavalry to keep touch with Jackson from the time he started on his raid till the end. Likewise, by means of his cavalry Pope ought to have kept himself perfectly informed of the progress of Longstreet's wing. Pope's cavalry was completely broken down, worn out by courier and escort service." (S 258.)

It appears that the strength of the Federal cavalry was largely frittered away by the detail of numerous and unnecessary detachments of cavalymen for duty as mounted messengers, that large units of cavalry were frequently employed for work which should properly have been the task of a few patrols, and that but little consideration was given to the physical wants of man or beast. The lessons taught as to the use of the cavalry in this campaign were taken full advantage of by

the Federal cavalry in subsequent campaigns.

The Civil War marked the beginning of the use of hasty entrenchments in the modern sense of the term. Such use had, however, at the time of the operations herein considered, not been considered as of any great importance by either the Federal or the Confederate leaders, including Grant, Sherman, and Jackson (2 R 96, 97). Jackson is stated to have said, "War means fighting. The business of the soldier is to fight. Armies are not called out to dig trenches, to throw up breast works, to live in camps, but to find the enemy and strike him." (2 R 481.) When on the defensive temporarily it was his practice to select a position which gave concealment to the troops and which afforded cover from artillery fire, to counter-attack vigorously and unhesitatingly, and to use the bayonet freely.

These operations afforded excellent examples of the use of reserves and of the employment of the counter-attack. At Cedar Mountain the fact that Banks pushed ahead too far with his attack without making any provision for reserves and the timely arrival at the critical time of A. P. Hill's division to support the Confederate line, was largely responsible for the defeat of Banks. Similarly the use of Early's Brigade of Jackson's wing to counter-attack in support of A. P. Hill on the late afternoon of the twenty-ninth enabled the Federal attack definitely to be repulsed, and Lee's counter-attack with his entire command along the entire front on the afternoon of the thirtieth won the battle.

"Except with General Lee's audacious plan for this campaign, which he justified by saying, 'The disparity of force between the contending forces rendered the risks unavoidable,' there is not much fault to find with the operations of the Confederates. Yet there is some. Lee ought to have gained a decisive victory on the 29th of August. He arrived with Longstreet's wing on Jackson's right early on the afternoon. If he had put these troops into action promptly and pushed down the Warrenton Pike he might have overwhelmed the right of the Union line, separating it wholly from Porter's corps standing idle behind Dawkins Branch. McDowell's corps would have been struck in flank on the Sudley Springs road, and forced with the right wing back upon Bull Run. This is what Lee started to do, but he allowed himself to be dissuaded by Longstreet. Longstreet wanted time to reconnoiter; then he reported against the movement. He said it would expose his right flank to attack by troops from Manassas. And Longstreet wasted time arranging his elaborate order of battle. The upshot of it all was, the whole afternoon was thrown away. Two of Longstreet's brigades were sent forward only to make a reconnaissance. It was they that drove back King's Union division at dusk."

Command Considerations.—On March 11, President Lincoln issued President's War Order No. 3, which, by relieving McClellan from his duties as General-in-Chief, served, for the time being, to abolish that position. This same order directed all commanders of Departments "to report severally and directly to the Secretary of War." The effect of this order was that the President and the Secretary of War assumed military command of the Federal armies. "Within four weeks from this time the States of Virginia and Maryland had been divided into five separate departments, under five independent commanders, while, as a wheel within a wheel, General Wadsworth was independent at Washington and General Wool at Fort Monroe." (U 293.)

On March 17, Major General E. A. Hitchcock was placed on special duty in the War Department as a special military advisor of the Secretary of War. Lacking other military agencies for his assistance the President had recourse to the plan of calling upon various Bureau Chiefs for advice and recommendations and there sprang up a sort of informal "Council of War" under conditions which were not dissimilar to those which led to the organization of a so called War Council shortly after we entered the World War—which exerted considerable influence.

Furthermore, in December, 1861, Congress had appointed a joint committee of seven members "to inquire into the conduct of the present war." "Had their investigations been confined to transactions that had already occurred, no harm would have ensued beyond the injury done to discipline by encouraging officers to criticize their superiors. But a knowledge of past events by no means satisfied the committee. It pried into the present and sought to look into the future. With little or no regard to secrecy it did not hesitate to summon commanders of armies in the field, who were asked and encouraged to disclose the numbers of their troops and their plans of campaign." (U 316.) Within a week after he assumed command Pope was called before this committee, and the knowledge of his plans, together with his views as to the proper plans for McClellan's army, thus acquired, produced a political pressure on the President which, in many instances, as in the case of the detachment of Blenker's division, he was unable to resist.

The consequences of these various steps and conditions were far reaching in their effect upon the conduct of military operations.

The fruitless character of his strategy in the Valley Campaign was apparent to Mr. Lincoln who saw clearly, from the ease with which about 17,000 Confederates had neutralized about four times their numbers, that the creation of the Departments of the Rappahannock and Shenandoah and of the Mountain Department had worked to the ad-

vantage of the Confederates. To remedy this evil an order was accordingly issued on June 26 merging them into one army—the Army of Virginia—commanded by General Pope, and the President, wearying of his responsibility as a military commander, on July 11 appointed General Halleck as Commander-in-Chief.

While it is true that General Halleck was designated as “General-in-Chief,” it appears evident from his memorandum to the Secretary of War, dated July 27 (with reference to his visit to McClellan at Harrison’s Landing), that the President or Secretary still retained personal direction and control over the movements of the armies. He considered himself “simply a military advisor of the Secretary of War and the President” (U 320) and to have become in effect a mere member of the military council by means of which the Secretary of War continued to exert a controlling influence in all military matters. He had accepted a position with no defined powers, with the additional disadvantage that for every mistake the people could now hold him responsible (U 320, 322, 323.)

Some of the results of this system, including the withdrawal of McDowell’s corps from McClellan, the withdrawal of McClellan’s army from the Peninsula, the effort to unite it piece-meal with Pope’s army on the advanced line of the Rappahannock, and the lack of cooperation between McClellan and Pope, have been indicated above. While the blame rests deservedly upon Mr. Lincoln and Mr. Stanton for their assumption of military command, it is but fair to bear in mind the difficulties that actually confronted Mr. Lincoln at the time. Undoubtedly he early appreciated the need for a commander-in-chief as his direct military adviser to whom he could confidently delegate the responsibility for the actual direction of the military operations, but no such leader had at that time been developed in the Federal army. When he consulted those generals presumably best qualified to give him advice they rarely agreed with one another. (Thus, General Scott and General McClellan differed widely as to the general conduct to be followed in the conduct of the war and General Pope and General McClellan themselves differed widely as to the advisability of continuing the Peninsula Campaign.) In the light of the knowledge available to him at the time it is believed that he cannot be criticized justly for his selection of either McClellan or Halleck. The grievous shortcomings of each must have been evident to him and in the absence of any one else upon whose ability he had reason to feel he could rely, it is not to be wondered at that he reserved to himself the general superintendence of affairs. That he and Mr. Stanton were “utterly without an intelligent grasp of the fundamental principles by which

the conduct of all military operations should be regulated" is undoubtedly true and their efforts to exercise military command unquestionably resulted in serious consequences. Mr. Lincoln's appointment later of General Grant as Commander-in-Chief in fact as well as in name indicated clearly his realization of the errors which had been so clearly pointed out in 1862.

Mr. Root, in his preface to Upton's *Military Policy of the United States*, for the publication of which he is responsible, wrote, "the conflict between the civil authority, represented by the Secretary of War, and the military authority, represented by a commanding general, and the consequent interference by civilian secretaries in the command of troops, always inexpedient and usually disastrous, has been obviated by the General Staff Act of 1903, which secures unity of professional military command, through the interposition of the Chief of Staff, with a body of military assistants, between the civil authorities and the military forces of the country."

Fortunately this proved true in the World War; it is to be hoped that it will prove true in the next one.

ORGANIZATION OF UNION AND CONFEDERATE ARMIES AT SECOND BATTLE OF BULL RUN

UNION

<i>Army of Virginia (Pope)</i>	<i>Army of the Potomac</i>
I Corps—Sigel 1st Division—Schenck 3rd Division—Schurtz Independent brigade—Milroy Cavalry brigade—Col. Beardsley	III Corps—Heintzelman 1st Division—Kearny 2nd Division—Hooker
II Corps—Banks 1st Division—Williams 2nd Division—Greene Cavalry brigade—Buford	V Corps—Porter 1st Division—Morell 2nd Division—Sykes
III Corps—McDowell 1st Division—King 2nd Division—Ricketts Cavalry brigade—Col. Bayard (Attached Division)—Reynolds	IX Corps—Reno 1st Division—Stevens 2nd Division—Reno

CONFEDERATE

Army of Northern Virginia (Lee)

<i>Right Wing or Longstreet's Corps</i>	<i>Left Wing or Jackson's Corps</i>
Anderson's Division Jones' Division Wilcox's Division Hood's Division Kemper's Division	1st Division—Taliaferro 2nd Division—A. P. Hill 3rd Division—Ewell Cavalry Division—J. E. B. Stuart

Troop Schools in the Coast Artillery Corps

By CAPTAIN C. E. BRAND, C. A. C.

AR 350-5 provides that there shall be maintained for the military education of the army of the United States certain established schools. Among these are enumerated (as affecting the army as a whole) :

- (a) The general service schools,
- (b) The special service schools,
- (c) The troop schools.

They are repeated here to emphasize the coordinate importance of the last mentioned—troop schools—with the special service schools, which each chief of branch fosters with such care, and with the celebrated General Service Schools, the War Department post graduate University of the Art and Science of War. Troop schools, being rather at the opposite pole of the army educational system from the General Service Schools, are prone to suffer somewhat not only in reputation, but also in actual worth to the service, as compared with the schools of more permanent organization. This is not unusual nor surprising. But it attracts conspicuous attention to the great field of opportunity which troop schools enjoy. For these schools include *every year* practically *all combatant troops* of the Army, which it appears some of the special service schools, notably the Coast Artillery School, will never be able to do. The study which follows is based upon the hypothesis that these schools, as conducted on the average Coast Artillery post do not accomplish the maximum possible toward their prescribed missions:

“To provide the basic course for commissioned officers . . .
and general military educational courses for . . . officers
on duty with troops.”

It is not presumed that such a maximum can be attained by arriving, through the medium of certain arguments, at certain proposed changes in system or method of procedure. It is believed, however, that added benefits can be gotten from the troop schools through careful study of the opportunities and handicaps presented, and through certain standardized solutions of problems which, many if not all, posts have in common.

The “basic course for commissioned officers” may be considered to include military sketching and map reading, rules of land warfare,

minor tactics, small arms marksmanship, customs of the service, etc. "General military educational courses" include normally such subjects as are taught in the battery officers' course in the special service school of the corps.

It will be noted that each of the courses prescribed for the troop schools, *i. e.*, (a) Basic Course, and (b) General Military Educational Course, may be divided into two parts: (1) General subjects, which should be required of all officers of whatever branch, and (2) Special subjects, essential only to the branch in which the officer is serving. The Basic Course (a) is largely concerned with general subjects, while course (b) includes the training of the branch in the technique of its own arms, and is therefore, in the main, special. Course (b) can very profitably, however, be made to include general subjects of great value, such as military history and map problems involving different arms, and similarly some special subjects may to advantage be included in the basic course.

With this general view of the troop schools it is now proposed to make a somewhat more intimate approach to the subject. Every officer has taken a greater or less variety of subjects in these schools, and most officers of a few years' service have taught some of them. The general subject is therefore well and understandingly appreciated from both the transmitting and receiving viewpoints. It is believed to be true that the most striking feature of these schools to the average officer is the great range of variations in the value of the same course as given by different instructors. Take, as an example, the course in "Gunnery for Heavy Artillery" which is given every year at every Coast Artillery post. Under Instructor "A" (a rather busy battery commander, we shall say) this course amounts to the rather dull process of reading from the training regulation and asking a few perfunctory questions concerning the text. Everyone is greatly relieved when it is over. The average impression is "a great waste of time." Under Instructor "B," however, this course is a most remarkably live proposition. After the first lecture everyone digs into his text and looks up with considerable interest what other books he may have on the subject. For the mimeographed problems handed out are thoroughly live and practical ones which tantalize as well as interest; and their solution requires a pretty thorough understanding of the problem which the Instructor works out, as well as a working knowledge of the formulas which he derives. When the final examination at the end of this course is finished everyone has discovered anew that "Gunnery is really a very live subject"—and that there were after all several small points that he had never known before.

The difference between these courses is not only the difference in ability of the instructors, though that is perhaps the greatest. But it must be remarked also that instructors in troop schools have as a rule their full share of post duties in addition to their detail as instructors. These duties are under the constant supervision of their immediate military superiors and require their primary attention. It is entirely practicable, however, to "get by" very creditably in the usual case as instructor of a course in the school by simply following the text perfunctorily. And no one knows how far the course falls short of what it might have been but the students—whose opinions of the instructor do not as a rule weigh very heavily with anyone. This easy exit is a great temptation to the instructor.

If, however, it could somehow be arranged that even Instructor "A" should devote himself in earnest to the preparation of his course in such a way as to produce his best, the general tone of his course would be greatly improved. And if only especially qualified instructors could be had—instructors after the order of Instructor "B," for instance—to assign to the preparation of courses, about as much would be realized as could reasonably be hoped for. However, everyone knows that officers cannot be relieved from other duties and assigned exclusively as troop school instructors. Neither can exceptional instructors be secured at will. It is to be assumed that as good instructors as are available are now habitually assigned to this work, and that their other duties are already made as light as practicable. It is therefore patent that this dual ideal will rarely materialize.

Consider this possibility, however. Suppose the course be *prepared* by a highly qualified instructor with such thoroughness that it can be given by a less qualified instructor with a minimum loss of effectiveness. Such detail of preparation would require perhaps twice the effort which would produce equally good results if the course were to be given by the superior instructor who prepared it. But if by this means the improved course can be made to reach twenty times the number of officers to whom the superior instructor is personally available, and save ten moderately ambitious instructors from the pains of preparing mediocre courses—and repeat this year after year without additional effort—it will certainly be worth much more than it costs.

The next question is: Is it possible, and practicable, so to prepare a course of instruction? And, if so, what general plan should be followed? Lest we endeavor to reach perfection by a single bound, let us at once delimit our field to Coast Artillery proper and see if *any* course may be so prepared. A course which has to do with the imparting of certain information will evidently constitute the simplest

case. In fact it will probably cause someone to remark "simply read the training regulation." If the training regulation were a perfect, or even a fairly suitable, text this thought would have more merit. But training regulations serve a variety of purposes. They are in many cases forced into tiresome and elementary details and necessarily repeat themselves with great tediousness. Some of them are directly suitable as texts for certain instruction. But on the whole they serve best as guides to training rather than as texts for instruction, particularly for officer personnel.

Suppose, for example, that the course in "Gunnery for Heavy Artillery" has for its first part, as a sort of introduction, "Explosives and Materiel;" and that we wish to cover first the individual subject of "Explosives." Clearly this is a subject about which every Coast Artillery officer should be informed. Yet, to be specific, how many battery officers could say whether or not gunpowder is a high explosive, and defend his position with argument; or explain the essential difference between a nitrocellulose (single base) propellant and nitroglycerin propellants. Can you give any approximate idea as to what rate of combustion is called a detonation? Did you ever hear of "tetryl"?

Suppose you set about looking for this information. It is not found in the training regulations. Some of it will be found in different publications of the ordnance department, if you can lay your hands on them. Some can be found in the Encyclopædia Britannica and other like sources. But you will spend hours in collecting information which you could have read and learned in fifteen minutes had a suitable *text* been available.

This case is fairly typical. The first need in whatever course there may be undertaken is a suitable text. And in a great number of courses it will be found that such a text does not exist. Texts are entirely too likely to be taken for granted. We forget that the planning of the excellent and efficient courses of instruction at our great universities includes basically the preparation of such a text (or texts) or its equivalent in lectures. This preparation is made with great care by the specialist who is to give the course, to the ends (1) of setting in their proper perspective and order of importance *all* pertinent phases of the subject, which requires that the specialist be a thorough master of his subject, and (2) of fitting the instruction to the intellectual and state-of-information level of the class, which requires an intimate acquaintance with the class of personnel to be instructed.

The artificial viewpoint of the student who embarks with serious purpose upon his first uncharted subject of study may be likened

closely to the viewpoint of the high school student who, having solved all manner of "prepared" higher degree algebraic equations with never a failure, is first confronted at college with the amazing and astounding revelation that in the general "unprepared" case even the modest cubic is a profound and awful mystery before which the devices and methods of ordinary algebra are helpless. Having spent hours on a single paragraph of a strange technical subject in the Encyclopædia Britannica in the pursuit of some elusive cross-current which forms a theme of his master's thesis, or having skimmed laboriously through page after page of a too-elementary French or German text in the false hope that it contained a new idea, the student at last becomes thoroughly aware of the harrowing obstacles which naturally beset the way of the transgressor into an unorganized field of learning, and is awakened to a live appreciation of the predigested texts upon which he subsisted as a freshman.

Now troop schools are distinctly undergraduate in their nature. Due to the natural obstacles which attend their administration they should be so conducted as to impart to the particular personnel for whom designed the greatest amount of correctly correlated information in its most readily assimilable form. To secure this end through the least effort on the part of student and instructor is the primary task of the specialist officer who prepares such a course.

Perhaps the most efficient method of imparting information is by carefully prepared lectures upon which students are required to take notes. These notes serve somewhat as future references for the student. But their main purpose is to cause the student to listen carefully and select and remember the salient points of what is said. If the lecture be written out in full, with the care to its composition referred to above, and distributed to each student to be read, it will serve its purpose almost as well, or quite so, if the student can be made to read every sentence of every paragraph with the assurance that each idea and every fact mentioned is of such importance as to deserve his attention, and with the care that will cause him to organize the subject in his own mind and retain it. It is proposed to do this by means of the new type of examination referred to briefly by Lieut. Col. W. H. Wilson in his article on "General Principles of Military Pedagogy" (COAST ARTILLERY JOURNAL, November, 1926).

This entire idea is best described by example. As an example of what may be done with the subject "Explosives" referred to above, there follows the written lecture on this subject. This should be taken as an example of the *worst* that could be expected under the proposed scheme of preparation of these courses, since it was prepared by an

"Instructor A," a busy battery commander entirely ignorant of chemistry and with no reference books other than the Encyclopædia Britannica and such few ordnance pamphlets as happened to be available. The occasion of its preparation was the detail of "Instructor A" to teach that subject in the local troop schools. It was prepared and used exactly as it is here proposed to use it and other similar lectures covering the several "information" courses which are given in the troop schools. It appears here without alteration of any kind since it was originally gotten up, though it is realized that many alterations might be made to its improvement by a more qualified "Instructor B."

EXPLOSIVES

GUNPOWDER

Gunpowder, the earliest explosive, was invented about 1300, the credit being claimed separately by one Schwartz, a German, and Roger Bacon, the celebrated English monk.

Gun powder is a mixture of saltpeter (potassium nitrate), sulphur, and charcoal, neither of which is an explosive itself. The mixture is physical rather than chemical, so that it is necessary to *powder* the ingredients as finely as possible and thoroughly mix in the proper proportions. The proportions have varied somewhat with different manufacturers, but as a general rule there is more than half saltpeter, with the other two ingredients in somewhat equal parts. Since the powdered ingredients vary in specific gravity they will not remain a homogeneous mixture if left loose and dry, even after such a mixture has been made. Early gunpowder, called "serpentine" from the small guns in which it was used, had this fault. It was later learned that if the powdered mixture was made into a paste with water, pressed into cakes, dried in this form, and the cakes then broken up into grains of any desired size, these grains retained the homogeneity of the original powdered mixture in addition to having the several ingredients compactly bound together within each grain, and constituted a "powder" far superior to "serpentine." This powder in grains was called "corned" powder. It was too strong for guns in use for several centuries after its invention, and was really too fast burning for entirely satisfactory use as a propellant in any gun.

Anyone knows that charcoal will burn if it is set afire and is allowed a supply of oxygen from the air. Saltpeter added to the charcoal liberates such a large quantity of oxygen in burning that the combustion of the mixture is quickened into an explosion. Sulphur is required in the mixture to complete the chemical reactions and give the explosion the proper violence.

Saltpeter, or potassium nitrate—also called niter, is formed in the soil, under proper conditions, from decayed organic matter, appearing as a fluorescent salt which may be extracted in a more or less pure chemical state. Sulphur is a chemical element occurring in nature as a yellow, brittle, crystalline solid. These two ingredients of gunpowder are more or less fixed in their constituency. Charcoal, on the other hand, a coal made by sub-

jecting wood to a process of smothered combustion, varies widely in its nature according to the kind of wood used. Charcoal most suited to the manufacture of gunpowder is made of dogwood or willow. The latter has been most extensively used.

Early attempts to reduce the rate of burning of gunpowder used as a propellant took the form of increasing the size of the grains of the "corned" powder. The form of "grain" finally adopted was a large hexagonal prism with longitudinal perforations to insure uniformity of burning. The rate of burning was also materially reduced by using a brown charcoal made of partially burned straw. The brown prismatic powder in use in our service before the introduction of nitrocellulose propellants was made in this manner.

HIGH EXPLOSIVES

Quite a number of present day high explosives were discovered fifty years or more before they came into general use incident to the later development of artillery (about 1900). One of the first high explosives to be generally used was picric acid. It is insensitive to shock or friction and can be burned at a rather high rate without danger of detonation. Yet it responds readily to the detonation wave set up by certain other explosives which are more sensitive and which may therefore be used as primers. Picric acid used as a detonator in the British service is known as "lyddite." In the French service this explosive is called "melinite." All picric acid derivatives have the fault of forming somewhat sensitive and therefore dangerous salts upon contact with metals. It is therefore customary to coat the inner surface of all shells to be loaded with these explosives with rubberine paint which will prevent such contact of the explosive with the metal of the shell.

Another high explosive, discovered even before picric acid (1863), is trinitrotoluol, usually abbreviated to "trotol" or "TNT." This explosive has all the merits of picric acid to an even higher degree and does not have its fault. It is extensively used in the British service and in our own. It is particularly used by the British mixed in varying proportions with ammonium nitrate to form the most widely used of all British explosives, amatol.

Fulminate of mercury is a high explosive which has been in practically universal use as a primer for other explosives since the earliest percussion primer was invented for the old time musket. It is sensitive to heat, friction, or percussion, and must therefore be manufactured in small quantities and with great care. As a primer for high explosives it is commonly used in conjunction with a somewhat larger quantity of a high explosive of intermediate sensitiveness known as a "booster" charge. The "booster" explosive in practically universal use in our service has the formidable name of trinitrophenylmethylnitramine, or tetryl. The only important exception to this statement is that the "booster" for wet guncotton is dry guncotton.

PROPELLANTS

Guncotton, or nitrocellulose, as it is known in connection with its more important uses, is made by treating cellulose, such as cotton fiber, with

nitric acid. The high explosive so formed is quite sensitive to shock when dry and is, on the whole, quite inferior to such high explosives as TNT, amatol, or the picric acid derivatives. It was formerly used in our service, wet, as a bursting charge in submarine mines, a small amount of dry gun-cotton forming the primer. About the eighteen nineties, however, it was discovered that nitrocellulose could be dissolved or colloided with certain substances such as ether and alcohol or acetone, and that the colloid so formed burned quite slowly in air. It was further discovered that this substance burned more rapidly under pressure, and that the rate and violence of its burning could be varied somewhat at will by variations in its form and by adding nitroglycerin; and that in no case did it detonate. It therefore approached the ideal requirements of a propellant. Ballistite and cordite are made in this manner. Cordite, the standard British propellant, is colloided with acetone, has a large nitroglycerin content and an appreciable amount of vaseline (about 5%) to prevent brittleness. The plastic mass so formed is pressed through dies into long cords, whence the name. A so-called double base (nitrocellulose and nitroglycerin) propellant of this nature was used in our service in the early years of this century in comparative test with a single base (nitrocellulose only) propellant which was in use at the same time. As a result of this test the single base nitrocellulose propellant colloided with ether-alcohol was adopted as standard for both army and navy. The nitrocellulose propellant has the marked disadvantage, however, that it is highly hygroscopic (*i. e.*, absorbs moisture readily). On this account all charges of propellant in our service must be kept in airtight containers and kept under careful supervision, including constant chemical tests, to detect any deterioration which may set in. This condition is not considered satisfactory, and the present efforts of the ordnance department are directed toward the developments of a more stable non-hygroscopic propellant.

It has been found convenient to shape nitrocellulose propellant into various cylindrical forms and to regulate its rate of burning by this means. It is a characteristic of the propellant that it burns "in parallel layers" or in other words at a uniform rate through the mass of any individual particle from all of its exposed surfaces. In other words, if the burning of any such cylinder be arrested at any given time, as may be done by firing a large cylinder from a short gun, the remaining unburned part of such cylinder is still a perfect cylinder. Thus, in order to increase the rate of burning of the long "cords" of British cordite, such cords are made hollow, or tubular, so that the burning may proceed from without and from within at the same time. The common form of propellant in our service is the multi-perforated cylinder. This cylinder is of comparatively short length (about two or three times its diameter) and is pierced by small longitudinal perforations, one central and six others equally spaced around it, so that the "web thickness" between any two perforations and between the outer perforations and the exterior surface of the cylinder, are equal. When the cylinder is burned as the gun is fired, therefore, the web burns through at all places simultaneously, leaving twelve small "slivers" of unburned propellant of more than half the original length of the cylinder. It is the aim in the design of the dimensions of the cylinders

of propellant for any given gun that these slivers shall be just completely burned as the projectile reaches the muzzle. The rate of burning is most rapid during the first few calibers of travel of the projectile, the pressure being rapidly built up at that time. When the web has burned through the rate of burning and the corresponding pressure in the gun drops off rapidly. This is plainly indicated in the relative strength of the walls of the gun from the breech forward to the muzzle, except that the drop in pressure is even sharper than this observation would indicate.

COMPARATIVE CHARACTERISTICS

As was mentioned in the case of gunpowder, an explosion may be considered as a highly accelerated combustion, though such combustion may not, in many cases, be initiated by fire or heat. In order to insure the requisite quality of safety in storage and in handling prior to use, military explosives are selected with especial attention to their insensitiveness to this rapid combustion or detonation through any agency except the wave of detonation itself set up through the ordinary means of heat, friction, or percussion, in a small quantity of more sensitive explosive which is not assembled to the bulk of the charge until immediately before it is used. The essential nature of the detonation is then as in the case of the explosion of gunpowder, an extremely rapid combustion, made possible through the liberation of large quantities of oxygen incident to the chemical reactions of the explosion. In gunpowder, as has been mentioned, the saltpeter is the oxygen-producing agency. It is mixed *physically* with the other constituents of the powder, and it is therefore essential to the proper functioning of the explosive that every minute particle of it contain molecules of saltpeter, of charcoal, and of sulphur in proper proportions. In all high explosives, on the other hand, the union of the several elements which constitute the explosive compound is *chemical*, so that every molecule of the finished explosive is similar to every other molecule, and each in itself is made up *necessarily* of the correct proportions in atoms of the oxygen-producer and of the other elements. The higher order of explosion (faster rate of combustion) of such a chemical explosive is therefore easily understood. In way of comparison, the rate of combustion of gunpowder (which might be called a "low explosive") is about 300 meters per second, while the rate of combustion of high explosives common in military use averages from 5000 to 7000 meters per second. This extremely high rate of combustion of high explosives is called detonation. It is in effect instantaneous, and is usually considered so. This accounts for the disruptive effect of a detonation, as compared, for example, with the progressive slow burning of propellants. The fundamental laws of the mechanics of gases hold equally, of course, for both. But while in the case of the propellant the time factor allows the weakest part of the container for the expanding gases (namely, the projectile) to move first and thus save the walls of the powder chamber from excessive stress; the practically *instantaneous* expansion of the high explosive acts against all the walls of its container with such suddenness that none is given the time to give way before it first, regardless of the relative strength of the several walls, with the result that all are shattered simultaneously and with great violence. An example

of this action may be had by detonating a stick of dynamite upon a large boulder, the dynamite unconfined and covered by nothing more than half an inch of soft mud. It will be found that the boulder will be shattered. This does not demonstrate that dynamite "shoots down," as has been erroneously concluded in some cases. It does demonstrate that its action is essentially that of a high explosive, as described above.

QUESTIONS

1. Gunpowder was discovered before the Norman Conquest of England. True—False.
2. Gunpowder was discovered before Columbus discovered America. True—False
3. Gun powder is a mixture of blue vitriol, potash, saltpeter, sulphuric acid, iron filings, charcoal, sulphur, lamp black, nitroglycerin, sawdust.
4. None of the ingredients of gunpowder is an explosive taken by itself. True—False
5. "Cornd" gunpowder was more efficient than "serpentine" because it was a more homogeneous mixture. True—False
6. The ingredients of "cornd" gunpowder were mixed with water. True—False
7. For best results gunpowder should be used while still wet. True—False
8. Potassium nitrate is an important ingredient of gunpowder. True—False
9. Sulphur is an organic compound. True—False
10. Charcoal is chemically pure carbon. True—False
11. Large grains of gunpowder burn more slowly than small grains. True—False
12. The brown prismatic gunpowder formerly in use in our service as a propellant got its brown color from the charcoal used. True—False
13. The charcoal used in brown prismatic gunpowder was made of willow. True—False
14. Brown prismatic gunpowder was a relatively slow burning gunpowder. True—False
15. Picric acid and TNT were discovered after 1900. True—False
16. Picric acid is insensitive to shock, heat, or friction. True—False
17. Ammonium picrate is a high explosive widely used in our service. True—False
18. Rubberine paint is used on the interior of shells filled with explosive "D." True—False
19. Trinitrotoluol is a picric acid derivative. True—False
20. Trotole is more satisfactory high explosive than explosive "D." True—False
21. Amatol is a combination of TNT and ammonium picrate. True—False
22. Amatol is a high explosive extensively used by the British. True—False
23. Fulminate of mercury is a high explosive. True—False

24. Fulminate of mercury is sensitive to heat, percussion, and friction. True—False
 25. Percussion primers are made with fulminate of mercury. True—False
 26. Fulminate of mercury is commonly used in fuzes. True—False
 27. Trinitrophenylmethylnitramine is a high explosive intermediate in sensitivity. True—False
 28. Tetryl is commonly used as the “booster” charge for wet guncotton. True—False
 29. Dry guncotton is insensitive to shock. True—False
 30. Nitrocellulose is a high explosive. True—False
 31. Nitrocellulose may be colloided with ether and alcohol. True—False
 32. Colloided nitrocellulose burns slowly in air. True—False
 33. Cordite is a double-base propellant. True—False
 34. Cordite is a nitroglycerin propellant. True—False
 35. The single base nitrocellulose propellant in common use in our service is colloided with acetone. True—False
 36. The nitrocellulose propellant in common use in our service is practically non-hygroscopic. True—False
 37. The nitrocellulose propellant in common use in our service is considered entirely satisfactory. True—False
 38. The common form of propellant in our service is the multi-perforated cylinder. True—False
 39. The “web thickness” is always the same at all parts of a “grain” of nitrocellulose propellant in the m. p. c. form throughout the burning. True—False
 40. The pieces of m. p. c. nitrocellulose propellant remaining after the web has burned through are called splinters. True—False
 41. Nitrocellulose propellant burns in parallel layers, *i. e.*, uniformly from all surfaces. True—False
 42. Gunpowder is a high explosive. True—False
 43. The mixture of the ingredients of gunpowder is physical rather than chemical. True—False
 44. A single molecule of gunpowder is explosive in itself. True—False
 45. Every molecule of TNT is an explosive in itself. True—False
 46. Saltpeter, in gunpowder, is the oxygen-producer. True—False
 47. The rate of combustion of gunpowder is 30 300 3000 30000 meters per second.
 48. The rate of combustion of tetryl is 70 700 7000 70000 meters per second.
 49. An extremely high rate of combustion is called “detonation.” True—False
- Key True: 2-4-5-6-8-11-12-14-16-17-18-20-22-23-24-25-26-27-30-31-32-33-34-38-39
41-43-45-46-47-49.
False: 1-7-9-10-13-15-19-21-28-29-35-36-37-40-42-44.

While the 49 “questions” cover most of the information contained in the lecture and a few common sense deductions from this information, it is of course apparent that a great variety of such questions might be added. It will be found that from ten to fifteen minutes will be required for the average student to answer these 49 questions—that

is, to check each statement as either true or false, or select the correct words when several alternates are stated, some of which are correct and some incorrect. This is sufficient time to be devoted to an examination in this subject, particularly when such thoroughness is realized as is in this case possible. But it would nevertheless not be amiss for the author of the course to prepare perhaps twice that number of "questions" (together with a key to the correct "answers") in order that selections might be made by the instructor giving the course for an "instruction test" of about ten minutes on the day the lecture is assigned, a weekly test covering this and other lectures assigned during the current week, and the final examination on the course of which it forms a part.

For the instruction test the local instructor might, if he wished, prepare questions of his own of the same type. But the final examination should be given as prepared by the author of the course for the purpose of insuring uniformity, and also in order that only tried and approved questions be used. For it will be found that these questions are by no means easy to frame. The following rules must be particularly observed:

- (1) Let each statement cover one fact, or one point, only.
- (2) Avoid negative statements.
- (3) Avoid ambiguities; *i. e.*, be sure that the statement, as it stands, cannot be construed by any reasonable interpretation as both true and false.

The safest rule is to "try out" a set of questions, after they have been as carefully composed as possible, on at least a half dozen students. If there are faults they will usually find them.

For a more complete discussion of this type of examination than can be undertaken here the reader is referred to the references made by Colonel Wilson in his article referred to above.

It is submitted that the above lecture constituted a concise, pointed recitation of the salient points of information on military explosives which should be in the possession of every officer of Coast Artillery. It is designed to fulfill the requirements of a satisfactory *text*, as discussed above. It is submitted further that the questions following, which should not be placed in the hands of the student until after the lecture has been studied, will furnish the incentive to careful reading of the lecture, particularly if it is known that the same test will be given to all officers of Coast Artillery taking the course, and if the satisfactory passing of these courses is made a matter of considerable importance to the individual officer.

It is believed that similar or better courses should be prepared in

all subjects which the War Department or the Chief of Coast Artillery desire to be taught in the troop schools, by officers especially selected and designated to prepare such courses. These courses should take the form of lectures, where practicable, one such lecture requiring usually not more than 30 minutes to read carefully, and containing a properly coordinated and balanced presentation of a particular phase of the subject. It will be noted that the above lecture can be read with all due care within from fifteen to twenty minutes. If one hour be devoted to the instruction of this subject it could well be utilized as follows: During the first 30 minutes each student reads and reviews the lecture. During the next 15 minutes oral discussion follows, under the direction of the instructor. During the last fifteen minutes the "instruction test" of about 50 questions is given. The marking of these questions, by the prepared key, will require less than a minute per paper, and any clerk may mark them. They are returned to the students at the following class. The student's interest having been aroused in the subject, he will do any supplementary reading which he may have available on the subject before the weekly test or the final examination. But even if he does no work at all except in class (which is painfully nearer the true state of affairs in most troop schools) he will have had the essential instruction in the subject, and the maximum efficiency in the utilization of the time of both instructor and student will have been realized.

It is true that not all instruction can be given in lectures. But upon a detailed examination it will be found that surprisingly little instruction cannot be so given! The true-false and other New Type questions give no practice in composition (which is negligible) and are not readily adapted to the solving of problems. But they can be made to cover *all* of most subjects, and a very large part of *any* subject. They are magic time savers, both in taking and in marking the examinations: are thorough to the *n*th degree, fair beyond question, and as exact in marking as mathematics. The fact that they are not perfect for all purposes should certainly not prevent their advantageous employment where they do apply. After all, perfection is rather rarely attained. The fact that some courses which should be taught in troop schools will present difficulties in preparation not encountered in the above example should, similarly, by no means discourage the preparation of all possible courses by this system; it is really the best at present available. These difficulties, when they are reached, will not be insurmountable. Consider the vast amount of correspondence education successfully carried on throughout the country in all subjects—*mostly practical subjects!* It is a credit to the courses here proposed that they are in fact ideal correspondence courses.

The 244th Coast Artillery

(9th REGIMENT, N. Y.)

THE 244th Coast Artillery, N. Y. N. G. (recently the Ninth Coast Defense Command) was organized in 1799, by consolidation into one regiment, the 6th Infantry, of all the uniformed companies then in the service of the State of New York. Four of these companies were of very early origin, two of them having been raised in England in 1690, "for our service in our Colonie of New York," and two having been organized in New York City in 1691 and 1693.

In July, 1673, Fort James at the Battery had been held by a small British garrison under Captain John Manning, but had surrendered to the Dutch. On November 10, 1674, the Dutch surrendered in turn to Sir Edmund Andros, who had arrived November 1, with one hundred soldiers in the pay of the Duke of York. On July 1, 1674, the Duke had directed Sir Edmund to establish a regiment at New York, and had commissioned him to be Captain of this the first company. In 1679, the Duke's troops at New York were subsidized by a grant of £1000, by his brother, Charles II. In 1683, Colonel Thomas Dongan became Governor of New York, and the pay of the Duke's soldiers became a charge against local revenues.

On October 27, 1684, the first provincial militia act was passed, and it provided for the organization of militia companies in all towns and counties "capable thereof" all of whom were "to be regulated as His Royal Highnesses Lawes directed." On October 23, 1685, "all the foot militia of the city and county of New York paraded before the gate of Fort James" on the occasion of the proclamation of the accession of the Duke, as James II, to the throne of England.

On August 11, 1688, Sir Edmund Andros, returning to New York after a prolonged absence, was "met by a regiment of foot and a troop of horse" then on duty in the city.

By 1689, certain of the troops in the city, "King's Soldiers" as well as militia had become disaffected, believing that they were being used to further alleged "papist" designs of the Lt. Governor, Captain William Nicholson. In June, 1689, Fort James was seized by the rebellious faction under command of Captain Jacob Leisler, who in a formal proclamation denounced the local government, but affirmed his allegiance to the newly proclaimed King, William of Orange, and to his Queen Mary. Leisler was supported in this action by the

"Committee of Safety," an organization of citizens, who appointed him Captain of the Fort "till orders shall come from their Majesties." Leisler changed the name of the fort to Fort William, and held it with one company of "King Soldiers" and four companies of militia against the smaller body of troops that remained loyal to Nicholson.

On June 24, 1689, the Lt. Governor sailed for England and laid the details of the rebellion before the King. He was thereupon empowered by the King to take upon himself "the Government of the Province." In order that the new governor might have suitable reinforcements with him on his arrival at New York, a royal decree of September 2, 1689, directed "that two Companies of Foot of sixty men in each company besides officers be forthwith raised for their Majesty's service in New York" and that these two companies be transported to New York on the same ship with the Governor. The decree provided "that the said two companies be paid out of the revenue here in England until the Government of New York be settled."

The organization of the two companies was greatly delayed, however, and they did not reach New York until January 29, 1691. On that date, the first company, under command of Major Richard Ingoldsby, arrived on the ship "Beaver." The second company arrived on the "Canterbury" a few days later. Two other ships, the "John" and "James," arrived with them, bearing military stores, and bearing also five hundred men for an expedition to Canada. Colonel Henry Slaughter had meanwhile been appointed Governor in place of Captain Nicholson, and had sailed from the Isle of Wight with the other ships, in his vessel "Arch Angel" on December 1, 1690, but had been separated from the others in a storm, and had grounded on a reef off the Bermudas, and did not reach New York until the middle of March.

Early in March, Major Ingoldsby's authority had been broadened to include command of all the troops at New York, including the "King's Soldiers" already there, and who appear to have been what were left of the troops brought over by Andros in 1674. Major Ingoldsby, immediately on his arrival, had made demand from his ship for the surrender of the fort, but Leisler had refused to recognize his authority. Owing to the strong show of resistance made by Leisler, Ingoldsby had postponed disembarking his troops until February 6. By that time, about five hundred of the "train bands" from the country had come into town, armed, and they, with the aid of "some well affected persons of Ye Citty" had made it possible for the dabarkation to be made securely.

Hesitating to attack the fort, in the absence of the Governor, who was daily expected, Ingoldsby had quartered his troops in "Ye Town House (the City Hall) and another house opposite thereto," and awaited there the arrival of Slaughter. Meanwhile, he "raised men and levied forces," locally, and incorporated them in his command. Leisler made vigorous protest over his action in so doing, and on March 16 issued a proclamation commanding Ingoldsby to disband his troops, whether "raised within this Province or elsewhere" or take the consequences. To reinforce his threat, Leisler "fired great guns through several houses of the City, particularly through the house where he understood their Maj^{ties} souldiers and ammunicon was lodged . . . and wounded a great many subjects in ye streets." The consequences were that Ingoldsby and his "Grenadiers" (as his two Companies were called), strengthened as they were by the recent levies and recruitments, seized Leisler and his troops March 20, and that Leisler was executed the middle of the following May. A year later, March 7, 1692, a royal commission was issued to Rev. John Miller as "Chaplain of the two Companies of foot in the Colony of Newyorke in America." These were still Ingoldsby's Grenadiers, into whose ranks had apparently come the remainder of the "regiment" that had been established at least in part pursuant to the Duke's order of July 1, 1674.

In 1691, a militia company known as the "Independent Company of Fusileers" was organized by the Common Council of the City, but soon came under Major Ingoldsby's command. In 1693, the three companies with a fourth organized that year, were sent to Albany and the Mohawk Valley to resist an attack of French and Indian invasion from Canada. In 1696, three of the companies, under command of Colonel Ingoldsby, were on duty at Albany and Schenectady, during "King William's War," as a British Garrison, "against His Majesty's enemies the French."

In 1709, the four companies served under Colonel Ingoldsby, as "Her Majesty's regular forces," in "Queen Anne's War" against the French, and took part in an expedition to Canada; Colonel Ingoldsby, as was the custom in those days, retaining command of his original company of Grenadiers, in addition to exercising command of the four companies consolidated into a provisional regiment. This regiment was formally organized in 1711. It was known as the "Blew (blue) Regiment," and was the first complete regiment of recognized British Regulars to appear as an American regiment on the lists of the British Army. (The fragmentary regiment of 1674 to 1689 had been personal troops of the Duke of York till 1683, and provincial troops thereafter.) The record of the Blue regiment (or of its constituent

companies) is without gap from this time until the Revolution, although during a considerable period its status was that of a battalion of four so-called "Independent Companies." At times these were paid and uniformed by the Colonial government, at other times by the Crown. References to the regiment, or to the battalion, or to the constituent companies (especially the "Grenadiers" and the "Fusileers"), appear on Colonial records at very frequent intervals..

January 16, 1756, Sir Charles Hardy, governor of the province, wrote from New York to the Lords of Trade in England, advising them of the amounts of "Warlike Stores in the Magazine of this Fort." "Small arms," he wrote, "we have none . . . but six chests that belong to the four independent companys." The city owned certain other arms which were stored in the City Hall, but these latter, he pointed out, were reserved for the use of "indigent" militia. With the outbreak of the French and Indian War, the same year, the "Independent Companies" were ordered to Albany, their place at Fort George, at the Battery, (the former Fort William) being taken by militia. At Albany, they were strengthened by levies from the militia, and the following year took part as "the New York regiment" in an expedition against Ticonderoga, in which they suffered extremely severely.

The four companies, reorganized, took part in the ill-fated Havana expedition of 1762, where they were almost completely wiped out. The small fragments returning the following year were disbanded by Governor Colden; but the companies were soon reorganized as the "Grenadiers," the "Fusileers," the "Cadets" (or "Governor's Guards"), and the "Foot Guards." Owing to inefficiency of their officers, however, and through lack of proper drilling (or "exercising," as it was then called), the companies became greatly reduced. Referring to this, Sir William Johnson, commanding the British Provincial forces, wrote to the Earl of Shelburne, December 3, 1767: "We have seen how the New York Independent Companies, first detached from His Majesty's best troops, degenerated in America through the avarice of their Captains, etc."

In 1772, there were in all, nine of the so-called "Independent Companies" in New York City. They paraded as a battalion under command of Colonel John Lasher. By 1775, their number had been increased to fourteen. On June 6, 1775, as the British Regulars of the time were withdrawing from New York to Boston to reinforce the troops there, Marinus Willett, aided by John Morin Scott and others, seized the supply carts carrying their surplus weapons, removed the arms, and turned them over to the Fusileers. A few weeks later, Colonel Lasher and his battalion seized the British cannon at the Battery, and carried them away despite the fire of British barges in the harbor. On June 26

of the same year, Lasher's battalion (including the "Grenadiers" and the "Fusileers") paraded in honor of General Washington, as he passed through the city on his way to Boston to take command of the Continental troops there. The battalion was compelled to parade again the same evening in honor of Governor Tryon on his return to the city from England. The "Grenadiers" were at this time commanded by Colonel Lasher, personally, as Captain, and the "Fusileers" by Captain William Livingston.

June 14, 1775, Angus McDonald, who had for some time been privately enlisting men "to serve under General Gage against their Country," was arrested by the Grenadiers and conducted before the Provincial Congress. On July 3, Colonel Lasher's battalion, now "City Militia," was reviewed by Generals Schuyler, Montgomery, and Wooster of the Connecticut forces. On August 14, a proposal was made "to the Independent Companies of Colonel Lasher's battalion" to serve as Minute Men. "To the honour of the whole battalion," it was reported, they unanimously agreed "to act as Minute Men, and to be ready at a moment's warning to defend their much injured country."

On September 15, 1775, the Provincial Congress ordered Colonel Lasher to make return of the officers of his battalion in order that they might be recommissioned. Differences of view arising as to the merits of the great struggle that all now foresaw, a meeting of the officers was held on January 29, 1776, to vote upon the question of entering the Continental service. Colonel Lasher presided. The vote was recorded as 15 to 15, the officers voting for their respective commands as well as for themselves. Colonel Lasher, together with the officers of the "Grenadiers" and the "Fusileers" and eight or ten others cast in their lot with the Americans and became duly enrolled with their commands in the Continental Army. The "Grenadiers" soon erected a battery for the Continental service, which was officially named "The Grenadier Battery" in their honor. On August 22, 1776, Colonel Lasher's battalion participated in the Battle of Long Island. On September 15, the battalion, as part of General John Morin Scott's brigade, participated in the retreat from New York. In October and November, they garrisoned Fort Independence at Spuyten Duyvil. Colonel Lasher was later captured by the British, and subjected to severe imprisonment for his so-called "infamous crimes!"

At the conclusion of the Revolution, with the disbanding of the Continental Army, several of its units were reorganized, entering as militia the service of the State of New York. Among these were the "Grenadiers" and the "Fusileers." Pursuant to the Militia Act of April 4, 1786, four regiments were soon formed in New York City, each

regiment having two uniformed flank companies. The rest of the companies were ununiformed. It became the custom to parade the uniformed companies as a separate battalion, which soon became known as "The City Legion." A fifth regiment was formed early in 1799, and on June 24 of that year the uniformed companies of all five regiments were consolidated into a new regiment, the "6th Infantry." Two of the companies thus transferred to the "6th" were the Grenadiers and the Fusileers. The "6th" was renamed the "2nd Artillery," March 27, 1805. In 1812, dispute having arisen as to the proper order of precedence of the several regiments, it was agreed to adjust the matter by drawing lots for the several numerical designations. The 2nd Artillery drew number 9, and in consequence became the "9th Regiment" on June 26, 1812. It retained that designation, with minor modifications ("9th New York State Militia," "9th New York Volunteer Infantry," "9th Coast Artillery Corps," "9th Coast Defense Command"), until February 1, 1924, when, under the general reorganization effected pursuant to the National Defense Act of 1916-1920, it was redesignated "244th Artillery," and this name was changed to "244th Coast Artillery" on May 14, 1924.

In the Civil War the regiment was mustered into Federal service June 8, 1861, as the "9th New York State Militia," but was also known officially as the "83rd New York Volunteers." It took part as a regiment in eighteen principal engagements in the Civil War, including Antietam, Chancellorsville, and Gettysburg. Company K of the regiment, serving as the Sixth New York Independent Battery, also took part either by section or as a whole in eighteen engagements. The regiment served with credit in the Spanish-American War, 1898-1899, as the Ninth New York Volunteer Infantry. The First Trench Mortar Battalion, furnished by the regiment, were the first New York troops in France in the World War of 1917-1918. In the World War, recognized units of the regiment participated in the St. Mihiel, Champagne-Marne, Aisne-Marne, and Meuse-Argonne offensives.

Through the incorporation of the Grenadiers and Fusileers in the 6th Infantry in 1799, the present regiment is believed to derive the most ancient lineage of any military organization in the United States. The regiment has to its credit what is believed to be the longest term of continuous regimental service of any regiment in the United States—125 years, 112 years of which were served under the same numerical designation. The regiment has the further unique distinction of having received into its ranks in the earliest days of the Republic, companies of former British troops that gave their allegiance and support to the American cause in the very earliest days of the struggle for Independence.

EDITORIAL

The Blue Uniform

ONE question now agitating the commissioned personnel of the Army is the matter of the adoption of a blue uniform for wear on dress occasions. The service weeklies have for some time had their columns filled by the complaints of their correspondents who fear that a new uniform—or will not—be adopted. These correspondents, presumably representing the more agitated portion of the personnel, appear to be, in general, company officers who can withstand least effectively this new attack upon their purses but who are also least familiar with the part a dress uniform plays in military affairs.

During the decade to the World War, it probably never occurred to any officer in the army to question the utility of the dress uniform. He took it as a matter of course. His service uniform was his working costume. When the day's work was done, he went home and changed to his dress uniform much as a workman would change from his overalls. His dress uniform was his normal costume on all occasions when not actually at work, and was his occasional uniform at ceremonies and ceremonial events.

The dress uniform, however, was not sufficient. For very formal military affairs, the officer had his full dress uniform, which was also occasionally called for on occasions of a social character. For the usual formal social affairs, he had his special evening dress. With this array of uniforms, he was prepared to appear suitably dressed on any occasion.

The war killed all garrison uniforms, and, for various reasons, they were not revived after the war. It is now proposed that we adopt—or do not adopt—a dress uniform to replace, more or less, the dress, full dress, and special evening dress uniforms of the pre-war period. This proposition is the cause of considerable foreboding and much argument. One side cannot see that a dress uniform is necessary; the other cannot see how we can dispense with it longer.

The arguments are circumlocutory, as all arguments ever have been, but the whole can be reduced to two questions. "To what extent is a dress uniform necessary?" "What will it cost?" If it is essential,

we must have it. If it is particularly desirable, although not entirely essential, and its cost is reasonable, we should have it. If it is not essential and the cost is excessive, we should do without.

The occasions on which the dress uniform would be needed are: normal evening, Sunday, and holiday wear; social affairs, as an alternative to evening clothes; all daytime social and military functions; most ceremonial formations and many garrison ceremonies. It can be argued that a special uniform is not absolutely essential on these occasions, but it must be admitted that one would be highly desirable.

The principal objection to this addition to our wardrobe lies in the probable cost. The price of service uniforms has increased almost exactly one hundred per cent over the price of the decade preceding the war. The dress uniform of that period cost about one-third more than the service uniform. As there is no reason to believe that the difference will now be any less, one need be no mathematician to figure what will be the probable result.

The increased cost might not be so hard to bear were it not for the fact that all other costs have also advanced, while the pay schedule has lagged behind. For example, fifteen years ago, a first lieutenant at Fort Monroe could, without any great hardship, employ two servants. Now, he finds it difficult to employ one. If he makes the attempt, he finds that one much less competent servant will cost him something like twenty-five per cent more than the two cost his predecessors. Whether necessary or not, an additional uniform will be a burden, although it must be remembered that the additional outlay will be partly compensated by the removal of the necessity of maintaining one particularly good service uniform for use only on special occasions.

The Army may or may not require a dress uniform. The question is not to be decided by the company and field officers. Their part is to trim sail, accept the decision of the powers that be, and hope that the decision will be withheld until the uncertainty concerning the personnel situation be settled.

Personnel Situation

With the completion of the studies by the various boards of officers on the question of promotion, elimination, and allied subjects, speculation continues concerning the probable remediable measures to be adopted by Congress during the coming winter. As was expected, the suggestions and recommendations coming from the boards were many and various.

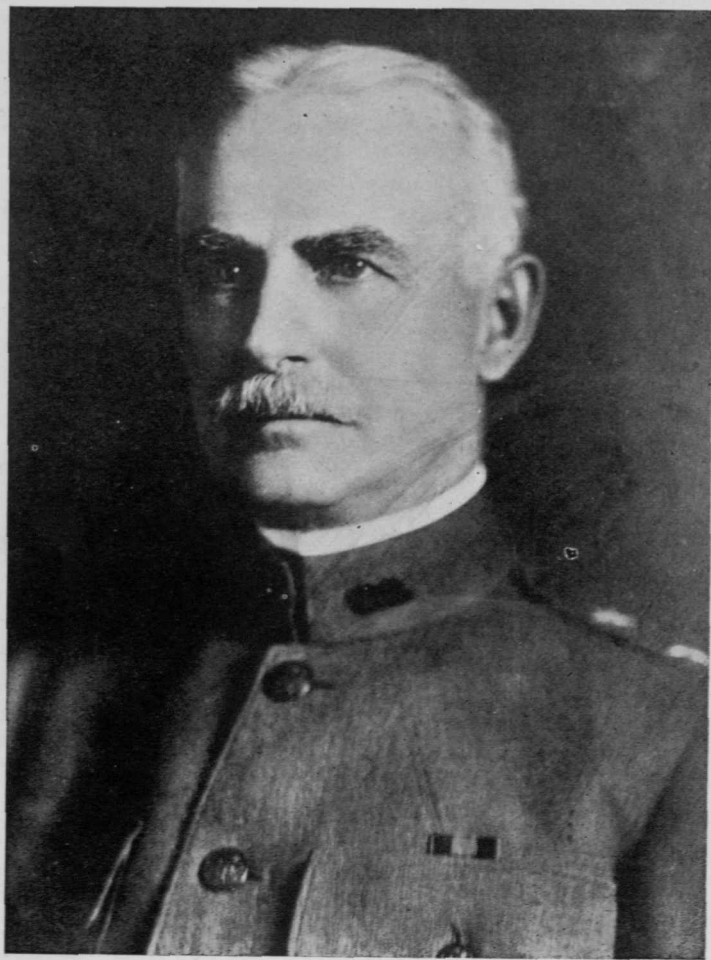
It is impossible to predict at this time what action, if any, will be taken. The best information the JOURNAL can secure seems to indicate that—

- (a) No change in the promotion list will be recommended.
- (b) Forced eliminations are not favored.

Other recommendations which have been more or less common to the preliminary boards are: limited voluntary retirement, or discharge with a gratuity; removal of the restrictions on the civil life employment of retired officers; an increase in the size of West Point; full advantage to be taken of existing laws covering the separation of officers from active service; and a revision of the pay schedule. It is to be hoped that these will all receive the attention they deserve.

APHORISME XXXIX

In the prosecution of Warre, there are often advantages met with-all by accident, which reason and judgement could not possibly fore-think of, much lesse direct; for things give better counsell to men, than men to the things: therefore the rigour of punishment due for transgressing a Commandement in Warre is not so strictly to be forced, if good successe approves it. But he that hath once transgressed the limits of his Commission, and thereby hath fair occasion offered to make an honourable amends, and in ample sort to justifie his first transgression, and wipe out the forfeit, that man makes a double fault not to take it. —Ward's Animadversions of War (London, 1639).



LIEUTENANT COLONEL CLARENCE P. TOWNSLEY

Commandant Coast Artillery School February 6, 1909-September 7, 1911

PROFESSIONAL NOTES

Sixty-Third Coast Artillery (Antiaircraft)

The Coat of Arms of the 63rd Coast Artillery (AA) was approved by the War Department on December 16, 1921; and its blazonry reads as follows:

Shield: *Purpure* (purple) a pile or (gold), three winged projectiles one and two counterchanged.

Crest: On a wreath of the colors (gold and purple) a dexter arm proper (in natural colors) holding a broken lance *gules* (red).

Motto: *Amor Patrial* (Love of Country).

The basis of the shield and colors was taken from the coat of arms of the Harbor Defenses of San Francisco, the crest is the crest of General Winfield Scott for whom the fort was named, and the motto is also that of the Scott family. Fort Winfield Scott in the Harbor Defenses of San Francisco was the birthplace of the organization, which was first known as the 3rd Antiaircraft Battalion.

The shield and motto are worn by the personnel of the organization as its distinctive regimental badge.

The designation of its units since their organization are as follows:

Headquarters Battery, Service Battery, Headquarters Detachment and Combat Train, 2d Battalion, and Battery E, 63d Coast Artillery, were organized in 1924, with present designations.

Headquarters Detachment and Combat Train, 1st Battalion, 63d Coast Artillery, was organized as Headquarters Detachment and Combat Train 3d Antiaircraft Battalion, in 1921 (which last designation was changed to 63d Artillery Battalion (AA) in 1922); was given the additional number, 259th Company, Coast Artillery Corps, in 1922; and assumed its present designation in 1924.

Battery A, 63d Coast Artillery, was organized in 1921 as the Searchlight Battery, 3d Antiaircraft Battalion; became Battery A, 63d Artillery Battalion (AA), with additional designation of 260th Company, Coast Artillery Corps, in 1922; and became Battery A, 63d Coast Artillery, in 1924.

Battery B, 63d Coast Artillery, was organized in 1921 as the Gun Battery, 3d Antiaircraft Battalion; became Battery B, 63d Artillery Battalion (AA), with additional designation of 261st Company, Coast Artillery Corps, in 1922; and became Battery B, 63d Coast Artillery, in 1924.

Battery C, 63d Coast Artillery, was organized in 1921 as the Machine Gun Battery, 3d Antiaircraft Battalion; became Battery C, 63d Artillery Battalion (AA), with the additional designation of 262d Company, Coast Artillery Corps, in 1922; and became Battery C, 63d Coast Artillery, in 1924.

Batteries D, F, G, and H were authorized in 1924, but have never been organized.

United States Cruisers

It was natural that the breakdown of the Geneva Conference should be followed by reports from the United States of new naval plans, but the suggestion in certain quarters that "full speed ahead" on "eight additional cruisers" has been ordered is quite erroneous. The eight ships in question were authorized as long ago as 1924. Such authorization amounted to very little until financial provision had been made for the ships. This was done for the first two, to be called the *Pensacola* and *Salt Lake City*, only in time to lay them down in June, 1926. The next three ships were put out to contract in March last. About the same time provision for the last three of the eight was made, with a reservation that the President could suspend building at his discretion in view of the pending conference. Exercising that discretion, he now approves and the construction is to go ahead, as was all along expected. But there is nothing new in the program. The only changes likely to result immediately from the Geneva failure is the expediting of the rate of construction. This will cost money which has not as yet been voted, and while everything depends upon the feeling of Congress on the matter when it meets again in December, there is reasonable expectation that acceleration will take place. As to a further program, the General Board of the Navy is understood to be in favor of twelve more 10,000-ton ships, to bring up the total to twenty. This is likely to be the ground of acute controversy if it forms the subject of a measure before Congress in the near future. While on the one hand the strong Navy party will rally popular feeling on the parity issue, the President and many of his influential supporters are keenly alive to the need for economy.—*The Army, Navy, and Air Force Gazette*.

Direct and Indirect Fire of Coast Artillery

An unnamed writer in the May 25, 1927, issue of the *Militär-Wochenblatt* gives a synopsis of a lecture delivered in March of this year by Captain Grotendorst of the artillery of the Netherlands army in the presence of the Minister of War on the subject of direct and indirect fire, of which the following are the essential points:

After the end of the war the majority of the military powers utilized the experiences gained by reorganizing their coast artillery by making a number of the batteries mobile and inaugurated indirect along with direct fire. From this there resulted the following advantages:

1. Inasmuch as the batteries are invisible from the direction of the sea they must first be discovered before being subjected to fire.
2. When the battery has been found and its position accurately determined, the attacker must likewise arrange his guns for indirect fire which is more difficult for him than for the defender.
3. Observation of shots is also more difficult for the attacker than for the defender because direct observation is not possible. Direction of the fire is therefore more uncertain for him because the defender can, by stationing observers in the sand dunes, determine the impact of the attacker's shots.
4. The service of the defender's guns is more composed because direct aim is absent and the service personnel sees no enemy.
5. Supplying ammunition, relief and care of service personnel and material, repairs, and replacements progress with the defender more quietly.

6. Indication of targets is usually absent and remains usually only with layouts having two positions: from the battery commander of one position to the other. In case of direct sighting of guns it is, however, necessary, in addition to the commander of the section giving the target to the battery commander, for the latter to transmit this to his guns and to a possible auxiliary post.

7. It is difficult if not impossible for the attacker to cover with his fire a coast extent of $2\frac{1}{2}$ to 3 kilometers. Neutralizing any of the batteries set up within this interval by indirect aim is out of the question. But in case of direct fire all guns are, on the contrary, within or in direct proximity of the foremost fringes of the dunes and the depth of the coast 200 meters.

8. The position of the guns can, since they need no longer be set directly at a target, be made uncertain by smoke or mist screens.

All these advantages are enhanced when the guns can be quickly shifted to other positions—a valuable strategic and tactical advantage.

The following disadvantages are inherent to indirect gun setting:

1. Loss of range: which is, however, of no great weight for heavy and long-range guns.

2. The formation of dead angles. This difficulty may be obviated by careful selection of gun firing positions.

3. Observation of impacts of shots is difficult since it is not always possible to post observers approximately in the line of direction of fire. But with direct fire, following the impact of projectiles on small targets at great distances under difficult observation conditions is not easy. The point of impact of projectiles with indirect fire can in all cases be determined very accurately with a good system of observation.

4. One must have several connections because not only vertical but also lateral deviations must be noted. This applies with increased measure to guns with movable positions.

A comparison of advantages with disadvantages shows that the former are more numerous and important for indirect fire and that mobility is necessary. For the latter there comes into question: first, lines of track rails, and second, motors. Coast guns on track rails have the advantage that: (1) They can be placed where they will be mostly used; (2) the batteries can be withdrawn from enemy fire; (3) the guns can be conveniently taken to repair stations; (4) the attacker will not be able to determine readily where the guns are posted.

A disadvantageous circumstance is that the guns must, on account of their weight, remain unarmored and that, in case of changes of position, opening fire is delayed because the gun cannot be fired from the rail carriage with heavy guns. Fifteen centimeters is the limit in this case although it may be increased in the future.

The preference of motor gun carriages *et cetera* depends upon tactical conditions and also on weights. Generally it may be said that there is at this time a more intense search for solution of a good tank armed with machine guns and a light infantry gun than of special motor artillery.

The lecturer then takes up the prospect for defense of the Netherland's seacoast with its main points Helder, Ymuiden, Huk-von-Holland, and Vlissingen in which he reaches the conclusion that, in consideration of the national financial situation, establishment of a continuous independent defensive resistance system against an attempt to landing on the coast line must be held in abeyance; that under existing circumstances Holland may always count on assistance from exterior

powers in case of an enemy attack on its coasts. It is therefore only a question of parrying the first thrust of forces attempting a landing. But even for this purpose it is necessary, in the estimation of the lecturer, to provide heavy or at least medium coast artillery with indirect fire control. In connection with that, one must consider whether or not existing seacoast forts have any value in case of an emergency.

In the discussion following the close of the lecture, the following remarks of Navy Lieutenant Brethower are worthy of notice: "In the battle of Jutland there was firing at fifteen kilometers with a sufficiency of hits. In a duel between two fleets one or the other will succumb, and if the navy succeeds in taking courage for a duel with heavy coast artillery it is condemned to destruction. Helgoland, for example, did not fire a shot because no one even ventured an attack. Hence the great significance of heavy artillery for coast defense. In Flanders, English vessels lying at anchor fired on German batteries at 25 kilometers range. It was for them simply a matter of finding the range from observations in the air; the English disappeared at once as soon as the Germans had demonstrated their superiority in the air.—G. R.

The Necessity of Unity of Supreme Leadership for Success in War

In an article published in the March 11, 1927, number of the *Militär-Wochenblatt*, Field Marshall August Urbanski von Ostrymiecz, of the former Austro-Hungarian army, gives very forcible reasons for the necessity of unity of the supreme command in military operations carried on by allied forces of different states or nationalities against a common enemy. He cites a number of instances where the want of such unity in the supreme command of the combined German and Austro-Hungarian armies resulted in disaster or in failure to secure full advantage of measures of combined initiative caused by want of complete agreement or failure of definite understanding of measures for pursuit of the objective toward a successful conclusion.

The writer states that as chief of the Evidence Bureau of the Austro-Hungarian general staff he had, in the five years preceding the war, frequent opportunities to hold annual conferences and conversations with every section of the great general staff in Berlin and to come into close touch with the chiefs of those separate sections and to become familiar with the differences in the points of view of the personalities of both staffs who, in case of war, would be charged to work shoulder to shoulder as directors of operations of the several departments devolving upon each of them. That it was his constant and earnest endeavor on each return from his visits to impress upon his own people the essential elements of differences that came under his observation and suggest methods of overcoming them. The extent to which he succeeded or rather failed in his efforts appears from the results which he outlines in the body of his article (the substance of which is here given) when he writes:

"There is adequate evidence of the extent to which war operations of the entente forces suffered injury in the beginning of the war for want of unity in leadership. This want of unity was fully recognized by the entente at an early stage, but it required many extremely critical situations before allies could be induced to submit unreservedly to the burden of subordination to the French

supreme command, but the power of the entente grew from that very day and continued to the end.

"In our own case it may be said that it was written in every regulation, was taught in every primary military school, and impressed upon every junior pupil of military science as a fundamental principle that *authority of command must be centralized and concentrated*.

"But when the great war came upon us the great leaders of both sides here and there in the domain of leadership were found wanting in the fundamental axiom that prevails and is recognized in every civilian undertaking and is in military operations decisive of success.

"The German army in itself was easily understood. In the unanimity of its people, in their faithful attachment to the empire spirit, stimulated by a united popular representative assembly that gave to the army whatever it needed, supported by a homogeneous corps of officers that had been brought up in military traditions and by a proverbially competent corps of noncommissioned officers, it was, at the outbreak of the war, the symbol of national power.

"As against this, the Austro-Hungarian army was a component of soldiers of the most distinctive separate nationalities that had been brought into being and trained in the pre-war decenniums, pervaded by the prevailing party dissensions, and was held together only by the devoted unselfish self-sacrificing work of its corps of officers. These national contrasts also made themselves perceptible in parliamentary appropriation activities. Every man needed for a new unit, every penny for a new organization, had to be fought for and frequently gained by concessions that infringed upon efficiency. Dualism, jealousy of the Hungarians for a purely national army, distinctive standing of Croatia in the framework of the Hungarian constitution, with the three separate command and language distinctions, the legal status of the war minister who was not permitted to address directly the several parliamentary assemblies, these and many others were peculiarities that were not known or appreciated even theoretically in Berlin, to say nothing of its inability to form a conception of their repercussive action upon the army. This want of understanding on the part of the Germans of the inner structure of our army was given serious consideration by me in view of the continuously advancing prospect for a struggle for existence, and I never failed, on every successive return from Berlin, to call attention to results that would ensue from it in an emergency. I saw a solution of the difficulties in suggestions of united action by both general staffs in promotion of combined war plays on a large scale, as well as of large maneuvers. It would exceed my present purpose to mention the arguments adduced for and against such projects and test their soundness. The fact remains that such mutual exercises did not take place, that the community of interests incident to a conflict involving both states were outlined in diplomatic papers, but that actually those who would be charged with direction of combined war measures went barely beyond establishment of arrangements for the initiative war operations and the distribution of forces pertaining thereto. Preparations for a coming war were limited to agreement of the views of the chiefs of the general staff. What then impressed me as a shortcoming stands out before me now as a fateful negligence. The guaranty that success in operations for opening the war depended wholly on a mutual perception of the situation of the enemy and complete knowledge of our own power and could be attained only by a thorough working out by both general staffs of every question affecting the approaching war and exact adjustment of all measures pertaining thereto was not perceived. In the

conversations referred to the question of the common operations *of the allies ought necessarily to have found a solution automatically*. All the frictions incident thereto in the war would necessarily have been cleared up in peacetime and would not have intruded themselves during the war. Many tensions that arose during the war from neglect of the measures referred to and which no doubt proved detrimental to our common cause would have been avoided.

"I recall that on the first mobilization day I met in Vienna the German military attaché. He begged me earnestly to use every influence that I could bring to bear to counsel unity of action because controversies were already beginning to make their appearance before the first man was set in motion. In that hour I was deeply impressed with the fact that my suggestions for working together mutually by both general staffs had failed to be heeded.

"In the progress of the war, I was confined to a sector as brigade and division commander and without opportunity for insight into the general situation and was frequently obliged to concur in criticisms directed against occurrences that could be explained only as due to want of unity of general operations of the allied powers. After the brilliant ejection of the Serbian army and of their government and the king from the country and annihilation of the retreat of the Serbs in the Albanian mountains came the sudden halt in front of Salonica which gave the entente opportunity, against all expectation, to set foot again in the Balkans. A sin of omission that bore in itself the seed of the crumbling process of the allies on that front in the fall of 1918.

"Almost the same fault was repeated in case of the remarkable successes at Karfreit, exploitation of which came to a standstill on the Piave, although the mutual placement of available forces from other fronts would have made possible complete utilization of the results of that great victory. There was then opportunity to continue the annihilation of the opponent across the Po, to assure ourselves of and secure the resources of all upper Italy, and to shut off the narrow neck of Italy on a few hundred kilometers width of front by use of a few divisions that could have been spared and thus secure a new inlet for the invasion of exposed southern France that was almost bare of troops.

"The brilliantly begun invasion of Rumania was similarly ended by half measures without utilizing decisive occurrences resulting from the tactical victory. The entente alway succeeded in holding fast to a support from which they should have been driven away finally. With a centralized direction of all the central power allies such half-measure successes would have been avoided; decisive action would have been arranged and undertaken with a sufficient levy of troops to assure success and its full exploitation. Unanticipated successes would have received deserved valuation by drawing on new forces. For a centralized direction of the objective of the common great aim of war—the destruction of the opponent by means of decisive operations wherever there was promise of success—there was substituted the separate interest of each of the several allies which became the cause of dissipating our power in the face of an opponent of superior numerical strength. The momentous experiences of the war may be summarized as follows:

"The consequences of a lost war are so heavily burdened for the state and the people and to generations succeeding them that every means must be seized upon to achieve success. A fundamental preliminary condition for success is unity of action in conduct of operations of the allied armies and navies. All other

ends—especially considerations of prestige—must yield to this fundamental requirement. The seriousness of the situation demands confident acceptance of the orders of the supreme leadership which can attain common success only by sacrifices at less decisive points.

"States and peoples that are called upon by political ties to undertake warlike operations in common must, in times of peace, come into intimate military touch; the organs of leadership must become familiar with the peculiarities of the allied armies. But above everything else the most critical question of all, that of supreme command, must be clearly settled long before the outbreak of the war. Only a well considered deliberate adjustment of this question can permit the work of the chosen central authority being carried on without friction and thus secure one of the most essential conditions of success."—G. R.

Antiaircraft Materiel Ready for Test

Preparation by the Army ordnance department of materiel for the antiaircraft exercises at Aberdeen Proving Ground, Md., is completed. Among the new materiel available for test are the following pertaining to machine guns:

Fire-Control instruments—Bausch & Lomb range-finder, modified; Goerz range-finder, modified; French stereoscopic range-finder; Barr & Stroud height-finder; Vickers data-computer; Frankford Arsenal data-computer; receivers for Vickers data-computers; Sperry transmission system for use with free mounts, and sights for free mounts.

Gun accessories—Caliber .30 water-pumps, cover-catches, and flash-hiders, and caliber .50 cooling units, flash-hiders, cover-catches, special bolt-handles, compensators with barrels, special firing-spring, buffers to reduce blow on back plate, and shoulder-rests.

Ammunition—Caliber .30 ball; caliber .30 tracer, 800-yard; caliber .50 ball, soft-core, cannelured; and caliber .50 tracer, 800-yard, red.

Pedestal and multiple mounts.

Experiments are continuing at Frankford Arsenal, Pa., with various types of bullets in an effort to improve accuracy and eliminate so-called "tipping" or "key-holing" encountered with caliber .50 ammunition. The experiments up to this time indicate the possibility of overcoming "tipping" by using a very hard core of lead alloy. Bullet-cores of Frary metal, so far, indicate their superiority over the standard lead hardened with 12½ per cent antimony.

Following request from the Air Corps, consideration has been given to the possibility of changing the design of the caliber .50 machine gun to permit the action to be held in retracted position for cooling. As a result of investigation, several designs have been prepared, a model of the design considered the most promising has been manufactured, and it has been submitted to the Air Corps for test and comment.

Promising results have been obtained at Frankford Arsenal in the investigation of chromium-plated machine-gun barrels. Tests with the calibers .30 and .50 barrels, so far, have indicated that the accuracy life is much greater than with the standard unplated barrels.

A caliber .50 antiaircraft machine-gun has been modified by lengthening the water-jacket to accommodate a 40-inch barrel. This gun has been prepared in a further effort to decrease muzzle flash.

Manufacture of 2,000 pistol barrels of stainless steel has begun at Springfield Armory, Mass. Their production will afford opportunity to accumulate additional information on a large scale as a check against what has been learned heretofore with respect to experimental samples of stainless steels supplied by various manufacturers.

As a result of satisfactory service tests by the Infantry and Cavalry, the Hatcher type of receiver-sight has been standardized for new manufacture of U. S. rifles, caliber .22.

The new types of magazine for use with the Browning aircraft machine-guns, caliber .30, as flexible installations, have been finished and shipped to Aberdeen Proving Ground for test along with an earlier type, which has been available for some time.

European Subsistence in Case of War

All the European powers, including even those having a remote pretension toward military prestige, are engaged in frantic efforts toward enlarging and improving in every way their military establishments. Every new invention and appliance for promoting destruction is eagerly seized upon and exploited to its full capacity by each one of them. Inasmuch as these appliances would be of use only in war it is reasonable to assume that each state anticipates that war involving it will come sooner or later. In view of this it may be pertinent to inquire whether or not these countries are equally interested in and are pursuing with equal energy solution of the problem of finding means of subsistence for their armies and civilian populations if war involving them should come. Acute attention is drawn to this question by an article written by G. Buetz and published in the May 25, 1927, issue of the *Militär-Wochenblatt* under the above heading.

From the statistics cited by the writer and from his explanation of their bearing on the subject matter under discussion it appears that every separately existing state of Europe is dependent, to some extent, for the supplies of subsistence for its population upon one or more other states either adjoining it or separated from it by great intervals. It is also shown that each one of them draws, either directly or through some of its neighbors, upon foreign countries—the United States, Canada, Australia, and South America—for a portion at least of the most essential elements of subsistence in the line of meats and fats and also of grains for bread and cereals and of forage for the horses and such meat producing animals as it now cultivates.

This being the situation in times of profound peace, what would be the result in case of war involving interruption to a greater or less extent of normal means of communication between the states of Europe and especially to those cut off from sea routes? Under these circumstances the problem for some of the European states of providing subsistence for its people in case of war anywhere in Europe may become more serious and difficult of solution than that of supplying arms and ammunition.

It is claimed that conditions in regard to production of subsistence supplies in Europe are gradually improving. Such improvement can be brought about only by more intensive cultivation of agricultural areas now in use because there are no new lands available except possibly to some extent in Asia Minor and Russia. It is also quite likely that any increase in production will be fully discounted or even surpassed by a proportionate increase of the population in each case. A synopsis of the above named writer's article follows:

"The European situation with respect to subsistence for its people is seriously unfavorable. It was even before the war unpropitious for an antagonistic European—Asian situation and has become materially worse since then. Let us consider in advance the reasons for this before adducing proofs of this unpleasant and indeed very serious fact. Europe depended for subsistence nourishment before the war to a large extent upon Russian provisions. Russia produced before the war almost as much wheat as did the United States, its export of wheat was much greater than that of the United States. The United States averaged from 1905 to 1914 an annual wheat export of 1,927,400 tons. Russia exported during the same period annually 3,710,000 tons of wheat and 613,000 tons of rye; to this must be added the important export of barley, sugar, butter, eggs, cheese, and poultry. Taken roughly it may be stated that Italy was subsisted by Russian wheat; England depended upon Russian butter, sugar, and eggs; Germany depended largely on imports of Russian-Polish poultry and eggs and in part on Russian barley. A second factor of increased disturbance of the favorable ante-war situation is due to Turkey and Rumania. Rumania was an important wheat area. Its wheat production was, on the average, from 1905 to 1914 almost 2,279,000 tons annually—almost half of that of Canada and Argentina. It exported before the war 62.5 per cent of its entire wheat harvest which averaged 1,353,000 tons. Italy and Belgium could not miss its export. Rumania's wheat export has, since the war, been nullified by its agrarian legislative restrictions. It has, in fact, been importing wheat for the time being. Turkey's productive capacity has been brought to a standstill and large wheat areas have, for the immediate present and for some time in the future, been destroyed or wholly withdrawn from production for European supply through alienation of the former Turkish wheat granaries, the Syrian Hauran plains, and the grain fields of Yemen. The great wheat areas of western Asia which were to be opened by means of the Anatolian railway and the Mesopotamian wheatfields have become a vision of the future. They are now the seats of conflicts brought about by Arabian insurrections and Turkish revolts against Italian—Greek—French aggressions.

"A third factor is the universal impoverishment of Europe and the resulting depression of prices of agricultural products and the incidental critical tone of the agricultural economic situation connected therewith. Political dislocation of the former leading agricultural states or sections of Europe has greatly fostered the disintegration of the subsistence economy of Europe; one need only recall the splitting up of the purely agricultural state of Hungary, the detachment from its former neighbor of the agricultural eastern Germany, the distresses of the agricultural Bulgaria. The situation in regard to agricultural products in France has also undergone material changes; the attachment to it of the industrial Lorraine area which formerly subsisted itself and the enormous militarization has made necessary the importation of large quantities of subsistence products.

"And how have these conditions exerted an effect on Europe's markets for materials of subsistence? Figures give only too clear an answer to the question. Europe—always excluding Russia—has doubled its wheat importations. Imports for 1925 were 1,075,000 tons as against an average of 575,000 tons in 1909-1913. Rye imports for 1909-1913 averaged 494,000 tons per annum and for 1925-1926, 1,110,000 tons.

"While considering these significant figures it must be noted that the consumption of the mass of subsistence supplies was much less in 1925 than before

the war because depreciation of currency and increasing poverty tended to restrain demand. Cattle economy has also suffered significant reduction in Europe. There has been great want of efficient meat-producing feed for meat animals, importations of much of which could not be paid for on account of high prices. There were on hand in Germany 70,246 calves on January 1, 1912, against 58,330 in 1924; swine, 5,280,000 before the war against 4,750,000 after. . . .

"As conditions are now, Europe is in a state of complete dependence upon foreign countries for essential means of subsistence except potatoes; the shortage includes also sugar. Aside from the United States of America it is Canada, Australia, and Argentina that determine today the world's means of subsistence. India measures up only for the single item of rice. If England should not succeed in directing South Africa's, Canada's, and Australia's means of subsistence to its own and its allies' ports, Europe would, in a short time, be as much starved out as war Germany during the recent world conflagration. That even England may not be able to obtain all needed subsistence supplies from abroad is among the possibilities."—G. R.

C. M. T. Camp, Fort Monroe, Virginia

The Fort Monroe Citizens' Military Training Camp ended on August 4, when 600 students from Pennsylvania, Virginia, Maryland, and the District of Columbia started the trek homeward.

Fifty-five of the students graduated from the "Blue," or final, course and are now eligible for appointments as second lieutenants in the Coast Artillery Reserve Corps.

The first year men, "reds," outnumbered all others in the camp, having 341 enrolled. Approximately 90 per cent of them were promoted to the next course, the "white." Some can not return next year and a few were disqualified for the higher course.

The "white course" men, 122 in all, go into the final, or "blue," course next year and, if they complete this final training period satisfactorily, will be eligibles for commissions next year.

Lieut. Colonel George W. Cochu, commanding officer of the camp, said in part in his farewell message to the students:

"It has been an honor to be your commanding officer. You have shown yourselves to be splendid young American citizens. I am confident that in your return to civilian pursuits you will feel the benefits designed for you in the Citizens' Military Training Camp and that you and those with whom you come in contact will be better citizens and better Americans as a result."

Major General Douglas MacArthur, commanding general of the Third Corps Area, made the commencement address, following a battalion review.

COAST ARTILLERY BOARD NOTES

Communications relating to the development or improvement in methods or material for the Coast Artillery will be welcome from any member of the Corps or of the Service at large. These communications, with models or drawings of devices proposed, may be sent direct to the Coast Artillery Board, Fort Monroe, Virginia, and will receive careful consideration. R. S. ABERNETHY, Colonel, Coast Artillery Corps, President Coast Artillery Board.

Projects Initiated During the Month of September

Project No. 581, Application of Adjustment Corrections, Time Required For.—An examination of target practice reports having shown that in many cases long intervals occurred between the determination of adjustment corrections and the application of such corrections to the guns, the Coast Artillery Board was directed to give an opinion as to length of time that should not be exceeded from the determination of an adjustment correction until its application.

Project No. 582, Powder Truck for Major Caliber Guns (Uzella).—A wheeled powder tray for use in major-caliber gun emplacements, designed by Sergeant Joseph Uzella, Battery B, 12th Coast Artillery, was submitted to the Coast Artillery Board for consideration. This tray appears to give more promise than any of the types that have heretofore come to the attention of the Coast Artillery Board.

Project No. 583, Graduation of Range Scales, Battery Woodruff.—The range scales on the 6-inch guns, Battery Woodruff, Fort Wint, P. I., were reported as being numbered for only every 400 yards and graduated at intervals of 50 yards. The Coast Artillery Board has made a study of this condition and submitted its recommendations to the Chief of Coast Artillery.

Completed Projects

Project No. 498, Predictor for 155-mm. Guns.

I—HISTORY OF THE PROJECT.

1. The test of this predictor was directed by letter from the Chief of Coast Artillery (OCCA 413.684/B, dated October 13, 1926), which is quoted below:

1. The following is extracted from a target practice report of Battery "A," 55th Coast Artillery, Fort Kamehameha, T. H., held on June 10, 1926:

"Special mechanical devices used:

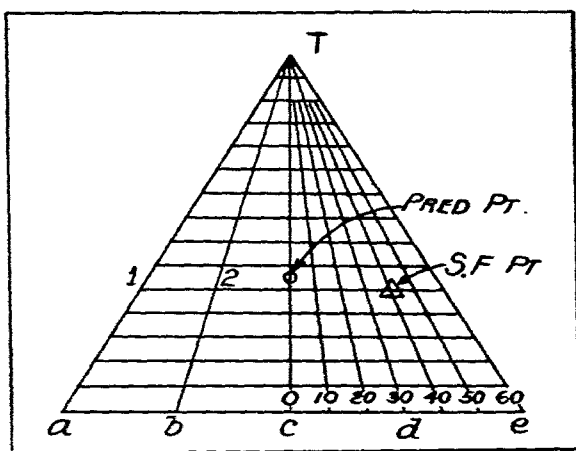
"The same mechanical devices were used this year at target practice as were used last year, except that a new predictor was tried and found satisfactory. It consisted of a six-inch square of zylonite upon which had been drawn a triangle whose base was four inches and whose altitude was five inches. Neither the size of the triangle nor the graduations are limited to the scale of the plotting board, so the predictor is universal for all armament.

"The base of the triangle is divided into four equal parts, each part representing 30 seconds travel. The division points are lettered from left to right on the base of the triangle as follows: a, b, c (the center line of the triangle), d, and e. The apex of the triangle is lettered T. Converging lines are drawn from points a, b, c, d, and e, to the apex of the triangle. The distance between points c and e is divided into six equal divisions of

ten seconds each and numbered from 10 to 60. Five-second lines are also drawn in red but not numbered. For purposes of explanation we shall call the section from *a* to *c* the travel section, and the next part from *c* to *e* the time of flight section. At regular distances from the base to the apex of the triangle parallel lines are drawn at an interval of $\frac{1}{4}$ of an inch. These lines are called travel lines. In the time of flight section a small slit is cut along the travel line so that a needle or a pointer can be pricked through to the plotting paper at the intersection of the travel line and the time of flight line.

Operation:

"The plotter places the predictor on the track of the target in such a manner that the travel line is a prolongation of the track. He uses the travel line which most nearly places the last two plotted points on lines *a* - *T* and *b* - *T*, moving the predictor at right angles to the track to get the best coincidence of plotted points on some travel line. In other words, he actually measures the amount of travel during the last 30 seconds not in yards, but by the length of a line, and sets the predicted point an equal distance ahead of the last plotted point at the intersection of the travel line and the line *c* - *T*. The setforward point is located farther along to the right on the same travel line at its intersection with the time of flight line corresponding to the range to the target. A small pencil mark made at the travel line rapidly identifies the line, so that the same travel will be used automatically where the travel is uniform. The edges of the zylonite square are all straight edges, and may be used by the plotter in drawing the track of the target. The predictor was found to be very rapid in operation, easy of manipulation, and obviated the necessity of the plotter calling the travel to the operator of the setforward ruler."



2. It is desired that you test the device described above and report as to its suitability for service use.

II—DISCUSSION.

2. *a.* A predictor of the type described above was made by the Coast Artillery Board. This predictor appeared to have a serious defect in that the predictor having been set properly along the track of the target it became necessary for the plotter to have in mind the time of flight and to determine visually the proper time of flight line at which to plot the setforward point; and to follow visually

this line from the time of flight graduations at the base of the predictor. This predictor is numbered I chart I. The interval between time of flight lines was 5 seconds instead of 10 as shown in the chart.

b. In order to overcome the defect stated in *a* above, another predictor was made differing from predictor I, in that a xylonite arm was pivoted at the common vertex of the similar triangles. This arm was provided with an index moving along a time of flight scale at the base of the predictor and with a means of clamping the arm. The time of flight scale was graduated with a least reading of one second. It was contemplated that the arm would be clamped at the proper time of flight and handed to the plotter by the assistant plotter; the plotter having set the predictor, as described for predictor I, would plot the setforward point at the intersection of the horizontal slit in prolongation of the track of the target and the time of flight arm. This predictor is numbered II in the chart. In order to obtain greater accuracy than with predictor I, the altitude for the system of similar triangles of predictor II was increased considerably. When predictors I and II are of the same physical dimensions they will possess equal geometrical accuracy. Either of these two predictors may be of such size as to allow for the maximum travel and time of flight that will be encountered; however, one of these predictors designed to meet these conditions will be of such size as to preclude its use at short ranges, because of interference with parts of the plotting board. This difficulty could be overcome easily by having one predictor for long ranges and one for short ranges as these predictors can be improvised locally at practically no expense.

3. The following extract is quoted from report of the battery commander of Battery "D," 52d Coast Artillery (Ry) on predictors I and II:

2. This predicting device was originated by Captain F. J. Fitzpatrick while with this battery and was used by the undersigned in two service practices last spring, using a one-minute predicting interval.

3. It is eminently suitable for service with the 12-inch mortar (railway) as demonstrated by the practices. It cuts down conversation in the plotting car and saves about four (4) seconds in predicting as compared with other methods. The predictor used by this battery did not have the pivoted arm and numbered scale at the bottom and no difficulty was encountered by the lack of it. Its advantage is not great and I think it could be dispensed with.

4. In the first practice last spring, the plotter consistently plotted a minute ahead, the error arising from his use of the edge of the predictor which, on the device used, was just a minute from the observing line. This is an unusual error and cannot be charged to the predictor. Giving a wavy cut to the edge of the predictor would preclude it from occurring at all.

5. The predictor returned is designed for a 30-second predicting interval; so it cannot be given further test by this battery which uses one minute. The one-minute predictor on hand will, however, continue to be used.

4. The predictors I and II were tested by Battery "A," 51st Coast Artillery. The report of the battery commander follows:

1. Two xylonite predictors were given this organization for service test and are returned herewith with report. They will be designated as No. 1 and No. 2. The following comments are made as a result of the test:

No. 1. Advantages.

(a) Light weight.

(b) Transparent so curved track can be seen.

(c) Setforward point can be taken without plotting predicted point.

Disadvantages.

(a) It is somewhat of a slow process to locate the predictor over the last two plotted points.

(b) The time of flight lines must be followed visually from the bottom of the predictor to the setforward point.

No. 2. Advantages.

(a) Light weight.

(b) Transparent so curved track can be seen.

(c) Setforward point can be taken without plotting predicted point.

(d) The setforward point is taken directly off a movable arm.

Disadvantages.

(a) It is somewhat of a slow process to locate the predictor over the last two plotted points.

2. It can be seen that the only objection to predictor No. 2 is the time required to locate the predictor over the plotted points. Both the setforward and predicted points can be located if desired. It is believed however that the predictor in use in this organization for the past 3 years, devised by Capt. G. H. Ericson, 51st C. A., is superior to either of the predictors submitted for test. The Coast Artillery Board has had a model of this predictor.

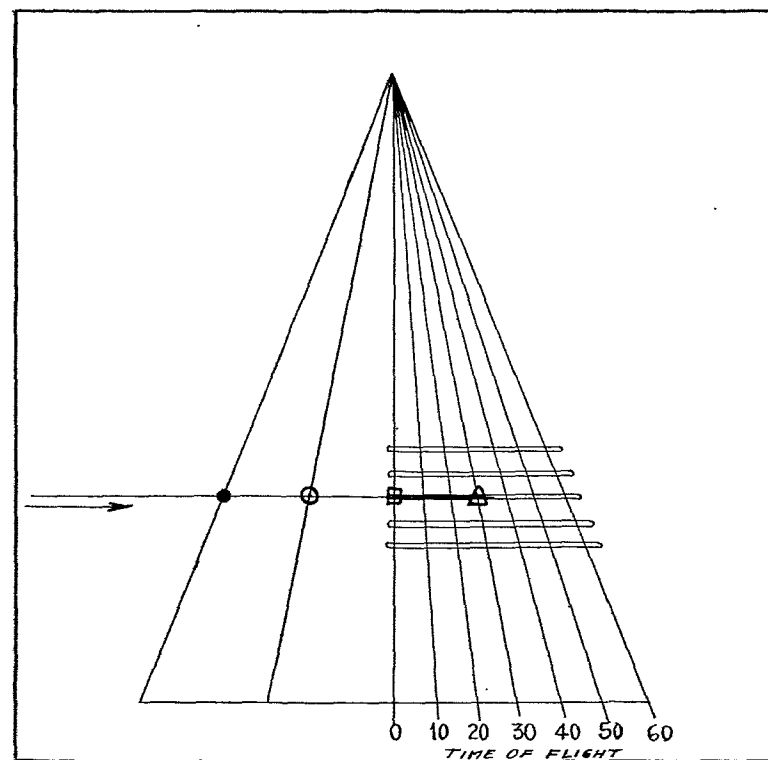
5. The predictor devised by Captain Ericson and referred to in the report quoted in paragraph 4 above is illustrated in the chart and numbered III. It is worthy of note that another battery of the 51st Coast Artillery abandoned the use of Predictor III and now uses a local modification of the Stephens Predictor. It was claimed for Predictor III that it could be operated very rapidly; but it was found that the gain in rapidity was accompanied by a loss of accuracy; the travel between the next to last plotted point and the second from the last plotted point being used as an argument instead of the travel between the last plotted point and the next to last plotted point. With a very slowly and uniformly moving target this loss of accuracy is negligible, but Predictor III does not appear to be satisfactory for service conditions, which would necessitate the setting of the travel after the last plotted point has been determined.

6. *a.* The difference of opinions concerning predictors is indicated further by a letter from Captain D. B. Greenwood, 52d Coast Artillery, which is quoted below:

1. Attention is invited to the prediction scales mentioned in Coast Artillery Board project number 220. As described in this project the scales are unsatisfactory, due to the necessity for a complete set for each different muzzle velocity and for each different projectile. However, if time of flight is used as factor instead of range, this objection is overcome and the same set can be used for any powder charge, and for any projectile. If made by an arsenal, one set could be used by any battery in the service which uses a 30-second prediction interval, and a second set will supply any battery which uses a one-minute interval. No other set should be necessary.

2. In use, it was found impracticable for these scales to be handled by the plotter, as it cluttered up his plotting board and took his mind off his plot. They should be placed in a rack, and kept by the assistant plotter or by a recorder who has less to do than the plotter. After the range has been sent to the guns, the percentage corrector operator, or the Pratt Range Board man if the Percentage Corrector is not used, calls off the time of flight for the next prediction. The man handling the scales hands the plotter the scale covering the time of flight indicated, if it is not already in his possession. This obviates the probability of the wrong scale being made.

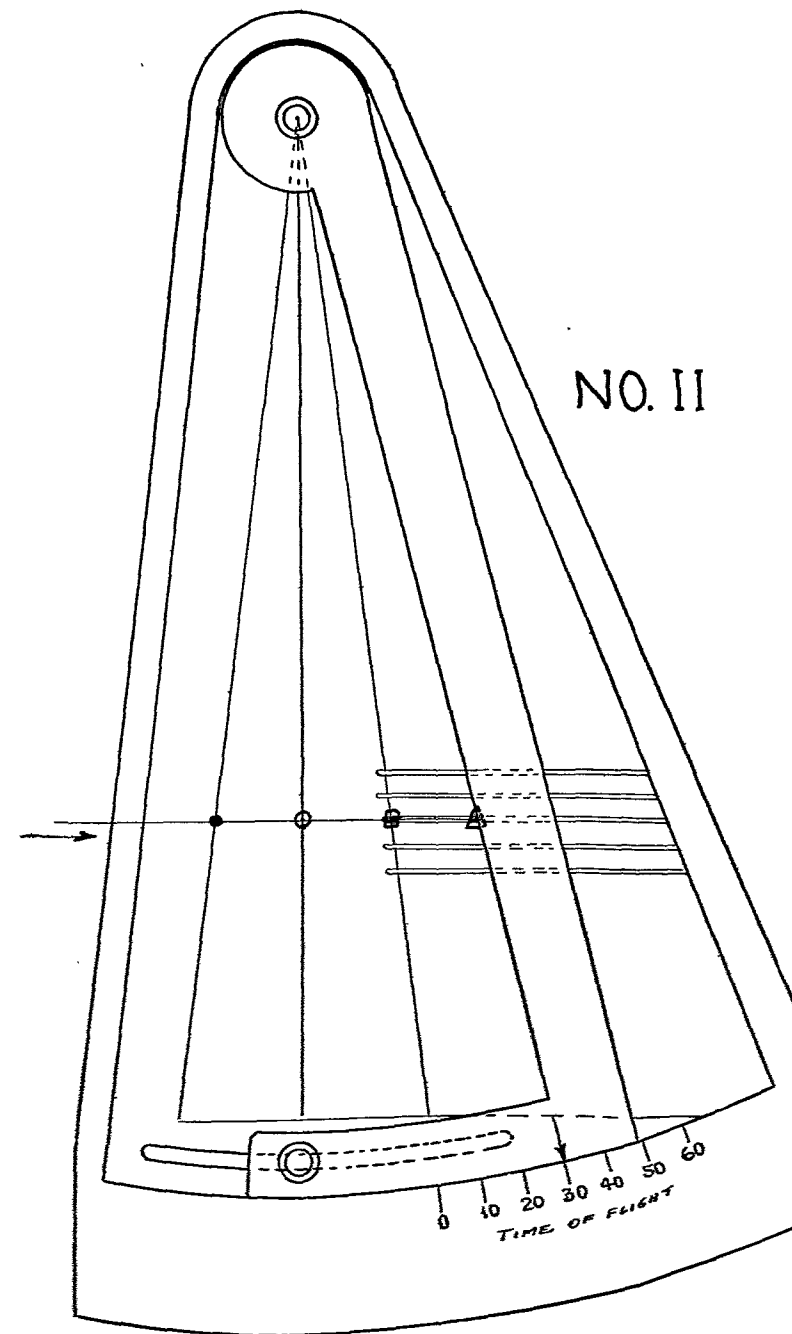
3. The scales should be made of brass, and be about the same size as the standard prediction scale now used. It was found that a wooden scale was soon marred by the edge of the targ. Each scale should cover three seconds time of flight, with no overlap. This introduces a slight error, but the benefit derived by reducing the number of scales is worth the introduction of this error, which will be about two yards in the travel of the target under target practice conditions, and about twenty yards in tracking



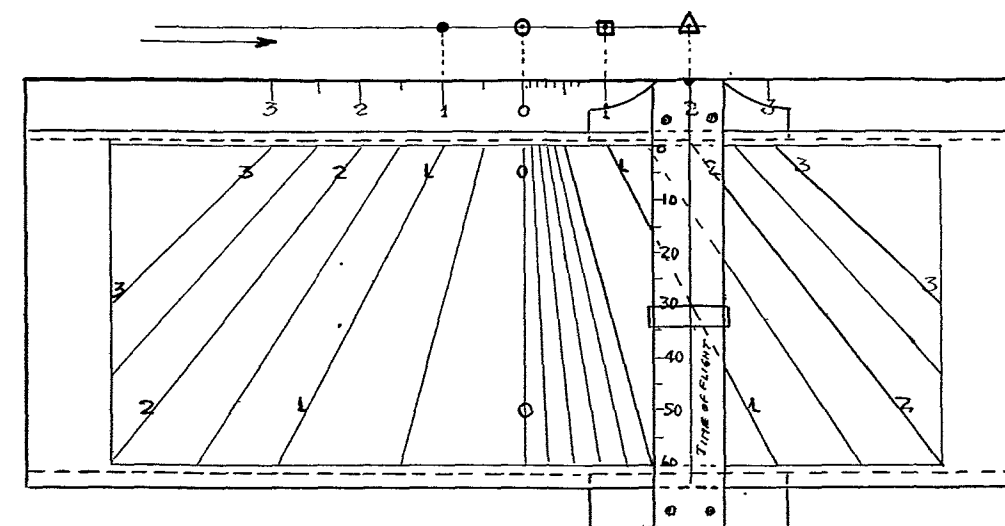
NO. I

LEGEND

- NEXT TO LAST PLOTTED POINT.
- LAST PLOTTED POINT.
- PREDICTED POINT
- △ SET FORWARD POINT



NO. II



NO. III

COAST ARTILLERY BOARD
FORT MONROE, VA.

PREDICTORS
C.A.B. PROJ. NO. 498

DRAWN BY	CHECKED	DATE	FILE NO
J. G. S.		7-8-27	J-37

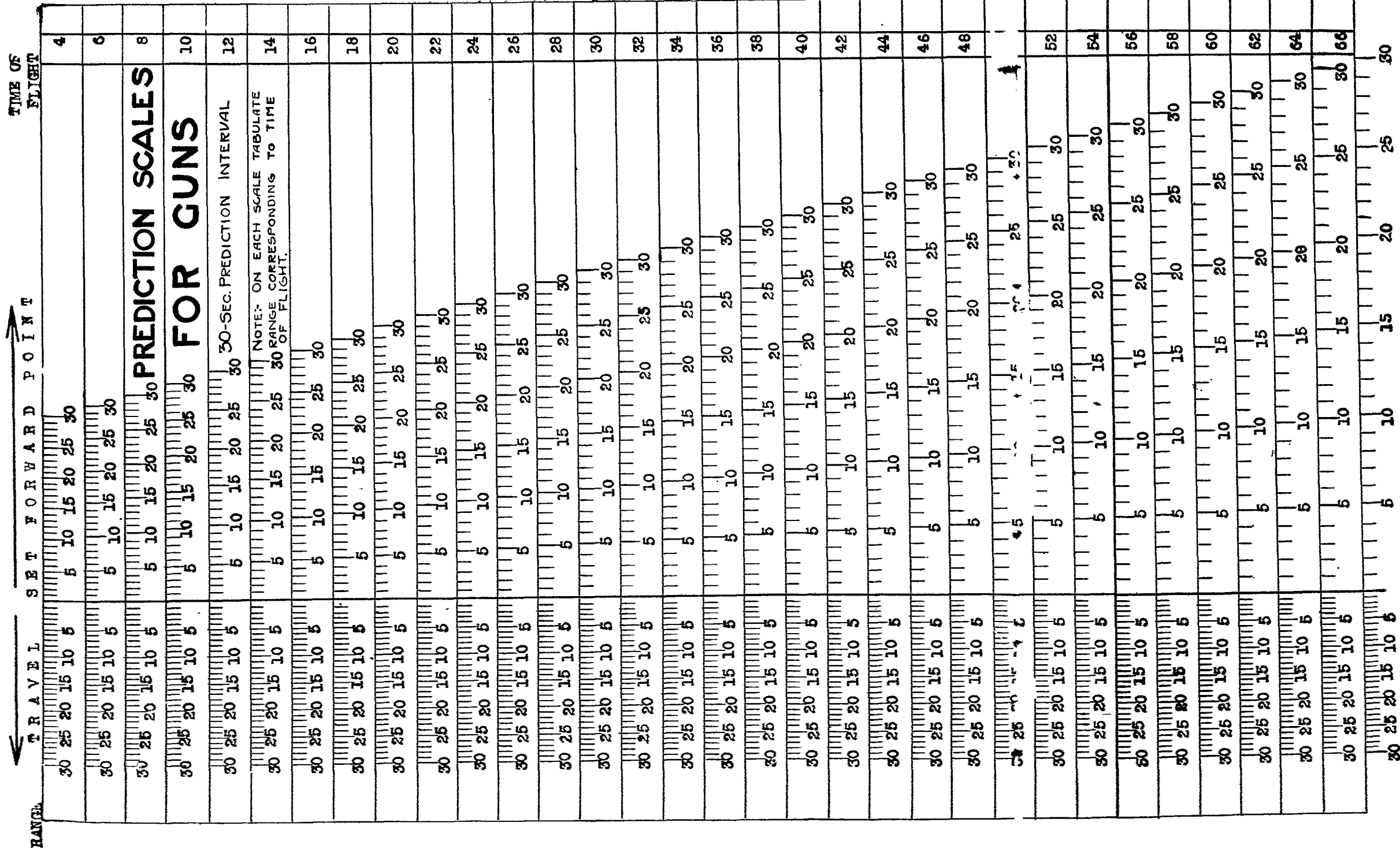


CHART II

a battle cruiser at maximum speed.

4. A set of these scales were used as described above, by Battery E, 52d Coast Artillery (railway), during the entire 1926 target practice season. They were so far superior to any other device tested that they have been adopted for this year's practice by every other battery in the regiment. They eliminate the calling of the travel of the target and the travel to the set-forward point, with a resulting decrease in the possibility of error and an increase in quietness and speed. They obviate the necessity for the Set-forward Ruler and its operator, without loss of accuracy. They are light and easy to handle, and for this reason are believed better than the Stephens Predictor. It is the opinion of the undersigned, that these scales offer a solution of the problem of prediction, for any battery in the service which does not require the determination of a predicted point.

b. Prediction scales similar to those referred to by Captain Greenwood have been printed (chart II).

c. The Mead Prediction Ruler reported upon in Coast Artillery Board Project No. 568 employs prediction scales similar to those illustrated in Exhibit "B," the scales being drawn upon an endless band of tracing cloth.

III—CONCLUSIONS.

7. The Coast Artillery Board is of the opinion that:

a. No one of the three predictors illustrated in chart I is suitable for adoption as a standard for Coast Artillery use.

b. Predictor No. II is the best of the three illustrated in chart I, and is on a par with the Mead Prediction Ruler (reported upon in C. A. B. Project No. 568).

IV—RECOMMENDATIONS.

8. The Coast Artillery Board recommends, in view of the fact that all of the predictors herein discussed, predictors I, II, and III, separate prediction scales as described by Captain Greenwood, paragraph 6a, and prediction scales as illustrated in chart II are in use by various organizations with apparent satisfaction, that the use of these predictors where desired be authorized pending the adoption of standard predictor, but that no one of these predictors be adopted as a standard for Coast Artillery use.

V—ACTION OF THE CHIEF OF COAST ARTILLERY.

The conclusions and recommendations of the Board in Project No. 498 are approved.

APHORISME XLIV.

A Generall is not to stay his provision for warre, although he be constrained to seeke for peace; because otherwise he seekes to beg or buy his peace, and cannot purchase it but at a deare rate; wherefore peace is never to be treated with our enemy, our Armour being of, or Sword sheathed; neither can it be easily concluded but under a Buckler.
—Ward's Animadversions of War (London, 1639).

BOOK REVIEWS

Five Years in Turkey. By Liman von Sanders, General of Cavalry. Translated and Published by The United States Naval Institute, Annapolis. 1927. 6"x 9". 326 pp. Ill. \$3.50.

The Introduction by the U. S. Naval Institute contains the following:

The war in Turkey formed an interesting and important part of the World War. Its relative importance as a theater of operation has been the subject of much controversy. This account will add much information to the student and assist in forming the correct opinion of the relative merits of the so called "easterners" and "westerners."

The book gives the author's reactions from day to day as various situations confronted him.

It throws light on the miserable condition of the Turkish lines of communication. It reveals the character of the Turkish officers and men, and while it points out their defects, it emphasizes their endurance and heroism. It frankly discloses the errors of officers in high places in Constantinople, and as bravely discloses the mistakes of the author himself.

The author prepared the notes for this book in Malta immediately after the Armistice, and the simplicity and frankness of the narrative attest the sincerity of the author, who has not failed to record his appreciation of his opponents in this great struggle.

The text relates the circumstances of his detail to Turkey and that a contract for the military mission to be headed by the author was closed in November, 1913. He arrived in Constantinople December 14, 1913, and continued as chief of the mission until October 31, 1918, when his functions were terminated by the Turkish Armistice.

General Sanders had hardly joined when (in January, 1914) Enver Pasha became Minister of War. From what follows, it appears that Enver and Sanders never got into accord, and always held "divergent views as to the interpretation" of the latter's "rights and duties."

General von Sanders proceeded to act with great vigor and must have made himself a nuisance to the indolent Turk, but up to the time of the World War at least was supported by Enver in "all suggestions the correctness of which he (Enver) recognized."

At the outbreak of the World War, Turkey decided to remain neutral though plans for a secret alliance with Germany were considered and general mobilization ordered. The mobilization had the desirable effect of bringing the Turkish units up to strength to permit war training. General von Sanders opposed the proposition for action against the Suez Canal "in case Turkey joined in the war" and advocated landing in the Crimea, but in this he found himself outvoted by the German and Turkish high commanders.

It may be interesting to quote the official pretext for the entry of Turkey into the War:

Fleet Commander reports at 11:15 p. m. October 29:

On the 27th and 28th the Russian fleet followed all the movements of the Turkish fleet and interfered with its exercises. The Russian fleet began

hostilities today. The Russian mine layer, three torpedo boats and a coal tender advanced today toward the Bosphorus with hostile intentions. The *Goeben* sank the mine layer, took the coal tender, heavily damaged one torpedo boat, took three officers and seventy-two men prisoners and successfully bombarded Sevastopol.

The mine layer carried 700 mines and 200 men. Using our torpedo boats we saved three officers and seventy-two men who will arrive in Constantinople on the 30th. It has been learned from prisoners that the Russians intended to mine the entrance to the strait and destroy our fleet. At Novorossysk, east of the entrance to the Sea of Azov the *Breslau* has destroyed fifty petroleum depots and fourteen military transports, etc.

Contrary to the Turkish plan greater events were in preparation in the Caucasus than on the Egyptian front.

A "holy war" was preached but failed to produce an overwhelming effect. General von Sanders points out the lack of logic of the Turks in proclaiming a "jihad when allied with infidel (Christian) states as well as of the British in claiming a crusade for Allenby who owed much to the assistance of the Mohammedan Arabs, not to mention his Indian troops.

Enver proceeded to take command of the Caucasus with a grand offensive plan contrary to Sanders' advices and was overwhelmingly defeated. An expedition against the Suez Canal was unsuccessful.

Meanwhile there was much confusion as to command in European Turkey which continued during the allied naval attack on the Dardanelles. Finally Enver decided to organize an army for the defense of the Dardanelles against the expected land attack and Sanders accepted the command.

The very interesting summary of this latter campaign takes but two chapters and is well worth study in comparison with allied accounts. To General von Sanders at least, it was a serious matter and failure of the Allies by no means a foregone conclusion. While no glory is claimed for success, it is made plain that the writer believes it to have been quite creditable to himself as leader and to his Turkish troops, and remarks on the failure of his achievement to raise "sentiments of gratitude at Turkish Headquarters."

In the chapter entitled "Events of 1916 on the several fronts," General von Sanders criticizes the sending of Turkish troops to Europe (except for the Roumanian campaign the result of which gave security to the Eastern frontier) and adds: "A full understanding of the entire situation in 1916, and perhaps earlier, made it clear that Turkey was no longer able to protect her own territories and frontiers."

In this chapter mention is made of the surrender on April 29 of General Townshend at Kut el Amara, and of the failure of British efforts at his relief, although according to Turkish reports the investing force had been reduced to 2000 men. General von Sanders suggestion that Townshend's command might have been so reduced by long investment as no longer to be capable of forcing a way out, is hardly sufficient to explain Townshend's inactivity on March 8 when a relieving force of two divisions reached a point about eight miles from Kut.

In December, 1916, General von Sanders was ordered to Germany and reported on the Turkish situation to von Hindenburg and to Ludendorf at Pless. The following is illuminating:

Between the two reports in Pless I was ordered to report in person to H. M. the Emperor in the New Palace in Potsdam. During this interview I had not much to say, for H. M. the Emperor spoke of the Gallipoli Cam-

paign and the excellent conduct of the Turkish troops in Galicia. H. M. was not well informed about Gallipoli and assumed a much more extensive participation of the submarines than had been possible under then existing conditions. After the long explication of H. M., I stated the limited period within which the submarines had gained results, and furnished the exact dates; the emperor seemed displeased at such a correction of former reports.

In 1917 after the loss of Bagdad the Turkish government started the oragnization of Army Group F which was called "Jilderim" (lightning), a term used by the Turks at the time of Napoleon's Egyptian campaign. This striking force was to have a staff like that of a German army group consisting almost exclusively of German officers with a German general at the head. Sanders complains that Germany committed herself, though unintentionally, to Jilderim without consulting the "military mission."

The first action of Jilderim was to be the recapture of Bagdad, a plan which the British frustrated by increasing the pressure in Palestine, where eventually was engaged the entire attention of Jilderim, the command of which General von Sanders accepted in February, 1918, and retained until the Armistice. The reverse side of the picture of Allenby's brilliant campaigns is well worth study.

Space limitations compel the mere mention of many interesting matters, *e. g.*, Sanders' opinion of the Armenian atrocities; the "mass dying" on several occasions of Turkish soldiers due to cold, hunger, and lack of sanitary measures; the attempt to draw Persia into the War; the effects of Lawrence's desert revolt; the terrible retreat from the Holy Land; and the incessant political intrigue.

On the whole General von Sanders thinks rather less of the Turk than do some of the Americans who have lived or served in that country in the last ten years. It is but fair to note this viewpoint is decidedly less egocentric than readers of the memoirs of German high commanders have become accustomed to expect.

The reviewer agrees unreservedly that in presenting this translation the Naval Institute "is rendering service to those who may be interested in the events of the World War."—R. S. A.

Navies and Nations. By Hector C. Bywater. Houghton Mifflin Co. 1927. 5½" x 8½". 285 pp. \$4.00.

Believing as he does that this is, as the jacket says, "an expert study of the naval situation of today" and that copies of this, like Jane's *Fighting Ships of the Nations*, should be made available for the use of officers of seacoast artillery, the reviewer is impelled to note that at times Mr. Bywater permits his subject to run away with him. For example, on page 1:

Among the agencies which contributed to the defeat of the Germanic coalition in the Great War, sea power has been awarded first place by a majority verdict of the historians on both sides. Naval force unsupported by land power would in all probability have been incapable of achieving victory; but although the two factors were interdependent the peculiarly decisive effects of the former on the course of the war become more and more apparent as the events of 1914-1918 are studied in true perspective.

This is of course almost unadultered nonsense. Even the first assertion in the second sentence is misleading because of the inserted phrase "in all probability." Not even the majority of enthusiastic naval historians award first place to sea power, and the facts are much nearer the opposite extreme; *i. e.*,

that the total contribution of sea power to the victory, despite the overwhelming superiority of the allies, was astonishingly insignificant, and that the course of the war would have been but little different had there been no fighting ships on either side. The lesson Great Britain should have learned from the last is that an *army* will be needed in the next great war.

Mr. Bywater proceeds to give this preponderant (?) importance in the war as a reason for the "universal significance in the political sphere that now attaches" to sea power. As a matter of fact the World War demonstrated to all the great powers the danger of unpreparedness for National Defense and aroused in the political sphere great interest not only in naval defense but in land defense, air defense, and particularly in the possibility of "outlawing war."

After this flight into the wide spaces of the imaginative, improbable, and even absurd, Mr. Bywater gets down to facts. He gives a broad outline of the post-war naval policies of the important powers, together with some interesting statistics showing the enormous cost of the present-day fighting ships, as an incentive to limitation by agreement of naval armaments. For example, in 1904 a British battleship cost \$7,500,000—the *Rodney* and *Nelson* will cost \$35,000,000 each. The cost of our airplane carrier is put at \$45,000,000; that of the 10,000-ton cruisers being built by five nations at from \$12,000,000 to \$15,000,000 each; and of an ocean-going submarine at more than \$2,000,000.

The reader will be especially interested in those chapters which deal with British and American naval problems, give reasons for the British government's desire for a great number of the cruiser type, and foresee the present difficulty of arriving at an agreement as to limitation of these types.

In analyzing the effects on each power of the limitation of naval armaments by the Washington conference, Mr. Bywater arrives at the general conclusion that all the interested powers were gainers and that naval enthusiasts only are dissatisfied. Great Britain, no longer the wealthiest nation, could not continue to maintain the greatest navy. The United States was relieved from competitive building against Great Britain and Japan, while Japan, by adopting a defensive role in her own sea area, avoided ruinous competition and secured herself against the construction of naval bases that might permit offensive action in that area.

Mr. Bywater does not think the United States lost anything of value in giving up the projected Guam and Manila naval bases, especially when this induced Japan to consent to an inferior navy. He thinks Great Britain and Japan have scrupulously observed the treaty, but that the Americans are at least evading it in giving increased elevation to their guns.

In his study of the cruiser situation the writer arrives at the conclusions that 10,000-ton type with 8-inch guns was unnecessarily powerful and that the treaty created an artificial type. He thinks, as do many British authorities, that Great Britain, because of her far-flung empire and enormous shipping, has need of cruiser strength beyond that of the United States and would never consent to a limitation corresponding to our requirements. This essentially British point of view fails to envision the increasing American leadership in world trade, which must be guarded whether or not our own ships are the carriers, the political and international considerations underlying the Monroe Doctrine, and that our commerce with and investments in some of the weaker states may make their security almost as important to our national well-being as the security of the self-governing dominions is to the British commonwealth. At the present rate of growth, our inter-

ests over-seas may soon be greater than the British, however great importance may attach to political relationships and sentimental ties within the British Empire.

The following are some of Mr. Bywater's ideas as to the present situation in Japan:

The Washington conference marked a turning point in her [Japan's] political career. It taught her that the Western communities, in spite of their fervent desire for peace on any terms consistent with honor, were determined to resist the pretensions of any one power to dominate the Far East or to close the open door in China. . . .

There is no doubt that the Washington Conference had a profound psychological effect on Japan. The fact that the greatest military nations of the world should meet in a conclave for the express purpose of negotiating a reciprocal reduction of armaments and that this purpose, contrary to all precedent, should be in a large measure accomplished, was a severe blow to the Samauri doctrines on which the Japanese masses had been nourished.

To a Coast Artilleryman some of the most interesting paragraphs are those which, with remarkable conciseness, describe the navies of the nations by types and estimate the strength of each navy by types and as a whole. While this information can be obtained from Jane's *Fighting Ships of the Nations*, Mr. Bywater's brief analysis will clarify the ideas of any but the profound student.

The last two paragraphs of this work are addressed to the British people, but are well worth consideration by all the nations:

The United States, for example, has already demanded and obtained parity with us in battleships and aircraft-carriers. If at any time it should decide to apply the same standard to cruisers and other craft, or, for that matter, definitely to out-build us in every class of combatant tonnage, it could do so without a doubt. An in view of the trend of American policy in recent years the possibility of such a decision being taken cannot be ruled out. Nothing is more likely to strengthen the hands of the big-Navy group in America than the resistance of foreign powers to the further limitation of naval armaments. A great deal of capital has already been made out of the British Admiralty's public claim to supremacy in cruisers.

Clearly, therefore, our true interest lies in promoting the cause of naval restriction by every means at our command. For reasons which have been expounded, and which are indeed self-evident, we can no longer hope to retain absolute supremacy at sea. That being so, it is obviously better to have the entire naval position stabilized by international agreement—provided that can be done without prohibitive sacrifices on our part—than to enter upon a new era of competitive shipbuilding in which we are virtually certain to be out-distanced sooner or later.—R. S. A.

APHORISME XXXVII

Shafts being bound together are not easily bowed, but taken one by one, may easily bee broken; so fureth it with the forces of an Armie, whose safety chiefly depends upon the unity and mutuall conjunction of the inferiours with the superiours, and of these one with another. Wherefore nothing is more dangerous in the service of Warre than discord and faction amongst the chiefe Officers of the Armie.—Ward's Animadversions of War (London, 1639).